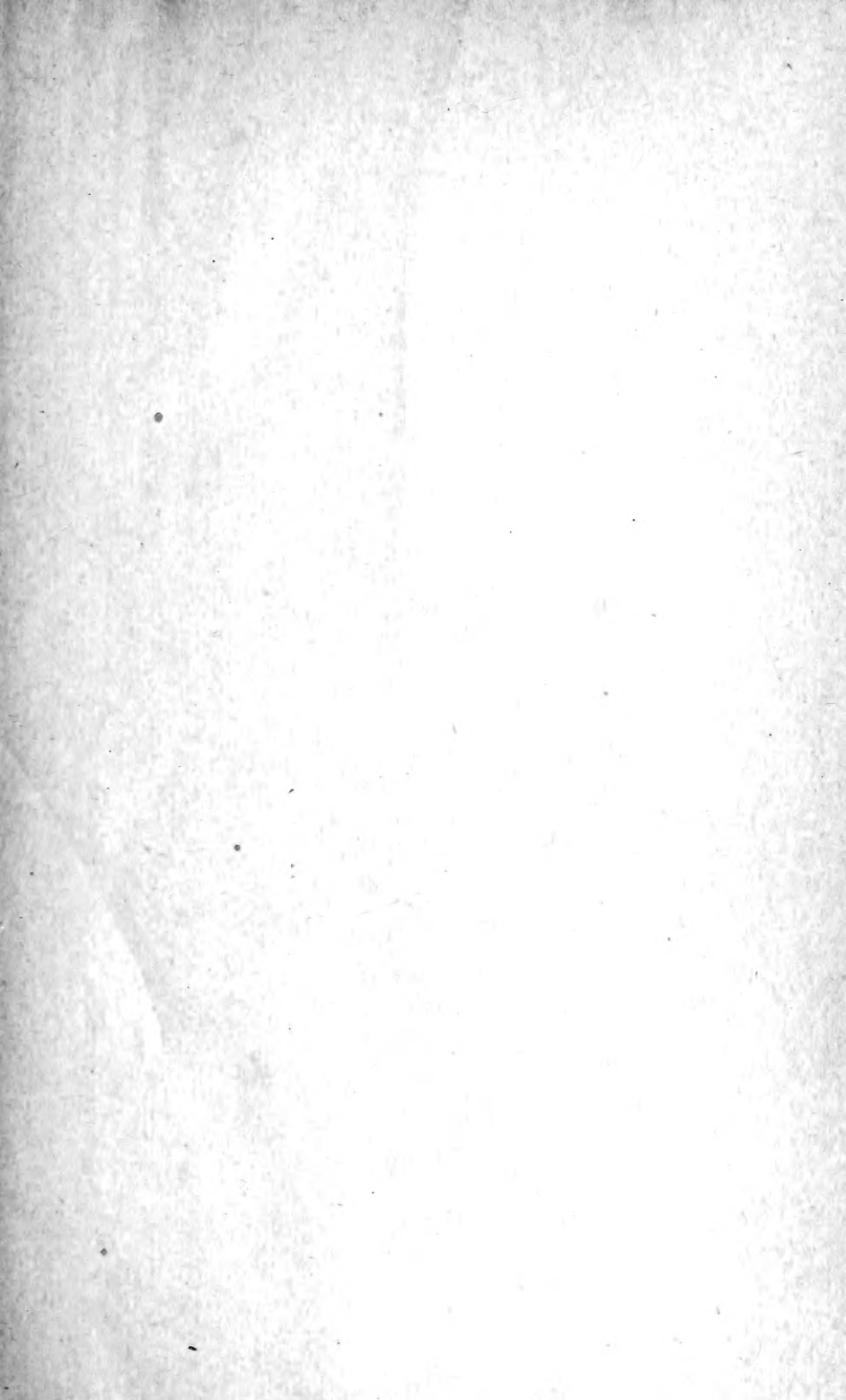
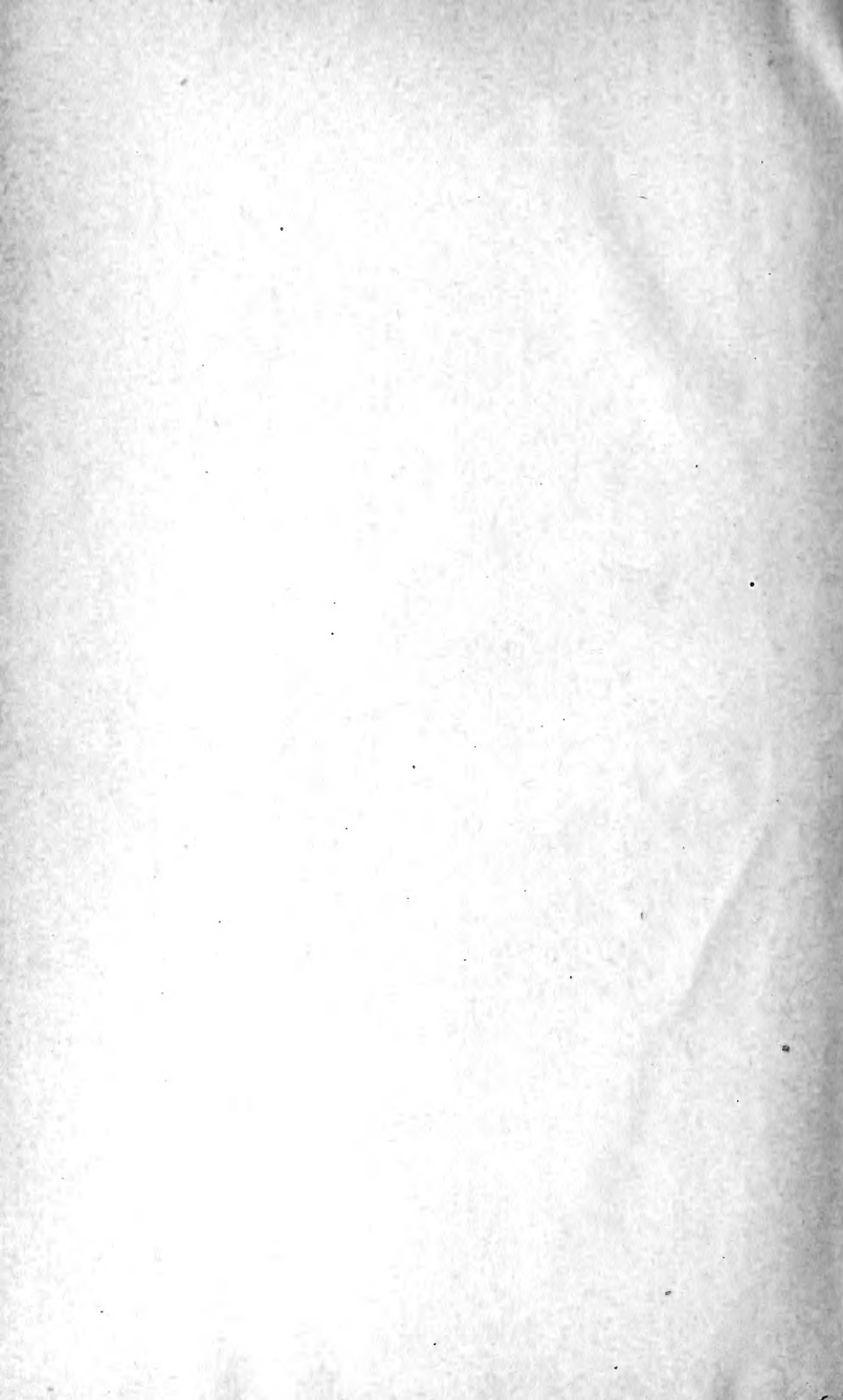


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University of the State of New York

NEW YORK STATE MUSEUM

FORTY-THIRD ANNUAL REPORT

OF THE

REGENTS

FOR THE YEAR 1889

TRANSMITTED TO THE LEGISLATURE MARCH 23, 1890

ALBANY
JAMES B. LYON, STATE PRINTER
1890



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REGENTS

OF THE

UNIVERSITY OF THE STATE OF NEW YORK

NEW YORK STATE MUSEUM

[The Laws of 1889, ch. 529, made the State Library and State Museum departments of the University.]

GEORGE WILLIAM CURTIS, LL. D., *Chancellor*

ANSON J. UPSON, D. D., LL.D., *Vice-Chancellor*

DAVID B. HILL, *Governor* - - - - -

EDWARD F. JONES, *Lieutenant-Governor* -

FRANK RICE, *Secretary of State* - - - -

ANDREW S. DRAPER, *Sup't of Public Instruction*

Ex officio

In order of election by the legislature

GEORGE WILLIAM CURTIS, LL.D., 1864	-	West New Brighton
FRANCIS KERNAN, LL.D., 1870	- - - - -	Utica
MARTIN I. TOWNSEND, LL.D., 1873	- - - - -	Troy
ANSON J. UPSON, D.D., LL.D., 1874	- - - - -	Glens Falls
WILLIAM L. BOSTWICK, 1876	- - - - -	Ithaca
CHAUNCEY M. DEPEW, LL.D., 1877	- - - - -	New York
CHARLES E. FITCH, 1877	- - - - -	Rochester
ORRIS H. WARREN, D.D., 1877	- - - - -	Syracuse
LESLIE W. RUSSELL, LL.D., 1878	- - - - -	New York
WHITELAW REID, 1878	- - - - -	New York
WILLIAM H. WATSON, M.D., 1881	- - - - -	Utica
HENRY E. TURNER, 1881	- - - - -	Lowville
ST. CLAIR McKELWAY, 1883	- - - - -	Brooklyn
HAMILTON HARRIS, 1885	- - - - -	Albany
DANIEL BEACH, LL.D., 1885	- - - - -	Watkins
WILLARD A. COBB, 1886	- - - - -	Lockport
CARROLL E. SMITH, 1888	- - - - -	Syracuse
PLINY T. SEXTON, 1890	- - - - -	Palmyra
T. GUILFORD SMITH, 1890	- - - - -	Buffalo

MELVIL DEWEY, M. A., *Secretary* - - - - - Albany

ALBERT B. WATKINS, PH. D., *Assistant Secretary* - Albany

Standing Committee of the Regents on the State Museum

ANDREW S. DRAPER, *Sup't of Public Instruction, Chairman*
Regents KERNAN, HARRIS, BEACH AND C. E. SMITH

State Museum Staff

JAMES HALL, M. A. (Rensselaer Polytechnic), LL. D. (Harvard)

Director, State Geologist and Paleontologist

CHARLES H. PECK, M. A. (Union) - - - - *State Botanist*

J. A. LINTNER, Ph. D. - - - - - *State Entomologist*

JOHN C. SMOCK, M. A. (Rutgers), Ph.D. (Lafayette), *Economic Geologist*

JOHN M. CLARKE, M. A. (Amherst) - - *Assistant Paleontologist*

WILLIAM B. MARSHALL, M. S. (Lafayette) - - *Assistant Zoologist*

PHILIP AST - - - - - - - *Lithographer*

MARTIN SHEEHEY - - - - - - - *Messenger*

JACOB VAN DELOO - - - - - - - *Clerk*

STATE OF NEW YORK

No. 51

IN SENATE

MARCH 25, 1890

FORTY-THIRD ANNUAL REPORT

OF THE

NEW YORK STATE MUSEUM

To the Legislature of the state of New York:

I have the honor to submit herewith, pursuant to law, the 43d annual report of the Regents of the University on the New York State Museum.

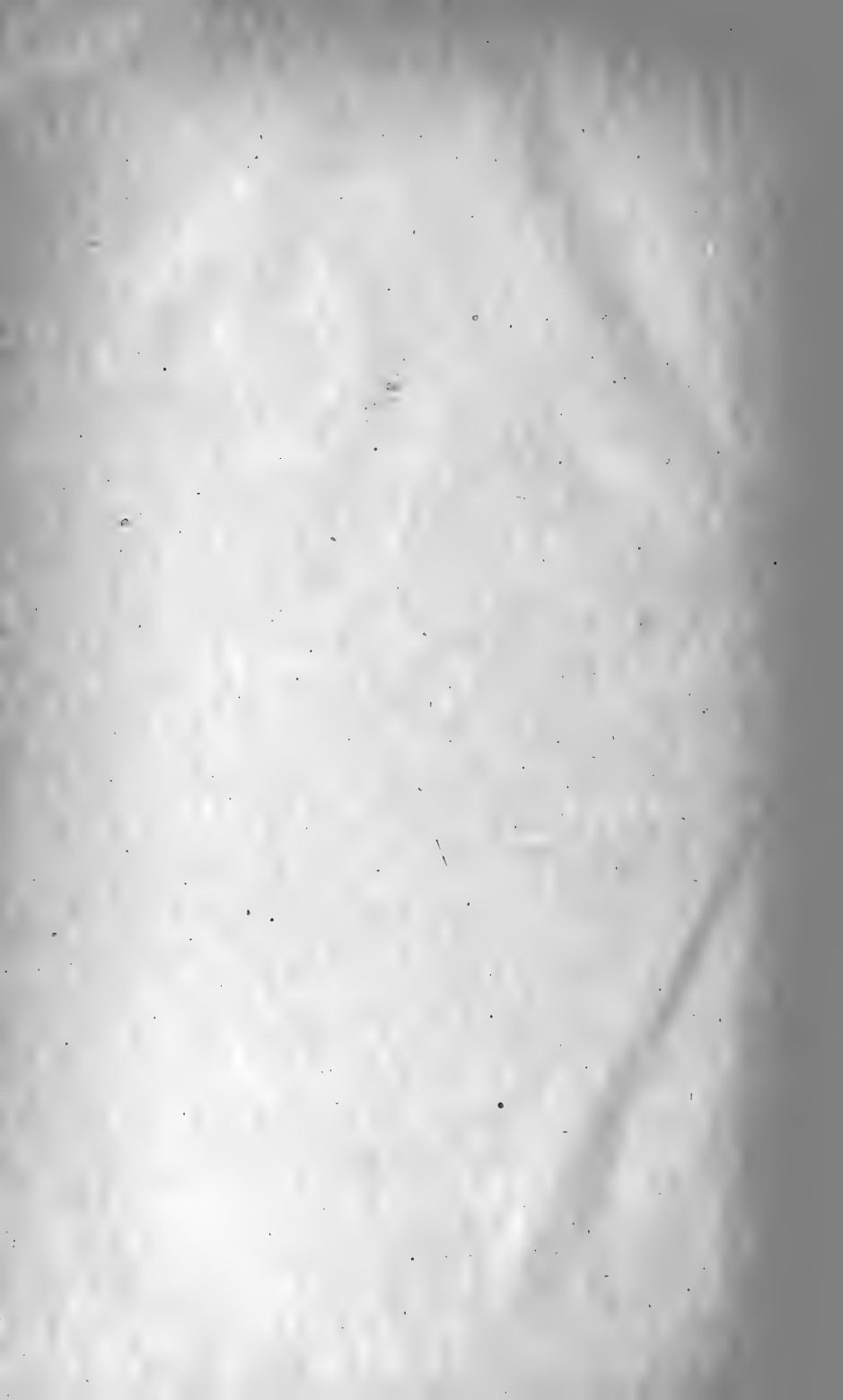
GEORGE WILLIAM CURTIS

Chancellor



STATE MUSEUM
OF
NATURAL HISTORY.

REPORT OF ASSISTANT IN CHARGE.



REPORT OF THE ASSISTANT IN CHARGE.

JAMES HALL, LL. D., *Director of the New York State Museum of Natural History:*

SIR.—I transmit herewith my report as Assistant-in-charge of the New York State Museum, for the year ending December 1, 1889.

Respectfully.

JOHN C. SMOCK

ALBANY, *December 1, 1889.*

CURRENT WORK.

The general care of the Museum, including the ordinary office work with its correspondence, the preparation of the bulletin on iron ores and the examination and selection of material for a second bulletin on building stone in the State, have occupied the larger part of my time. There is an increasing number of calls and of requests by letter for information relative to minerals of economic importance which may occur in the State. They are time-consuming, as they require, in many cases, correspondence, in order to get the requisite facts or careful examination of reports, since it is impossible to acquire at once a personal knowledge of all the localities of the occurrence of these mineral staples in the State. The value of the Museum to the people and its return to them for their support of it, is felt to be so great as to warrant the time thus given to all who come to it for help. It is, in fact, a geological bureau, and is thus engaged in the instruction of the people.

Leave of absence was granted me for two months to visit the glaciers of British Columbia and Alaska. Shortly after this action by the Board of Regents, I started, passing through Ottawa, in Canada and availing myself of the advantages of seeing the Museum of the Canadian Geological Survey, *en route* west. The Illecillewaet glacier, near Glacier Sta., in British Columbia, was visited first. An attempt was made to explore the glaciers on

Mt. Tacoma, Washington, but the season was so unfavorable by reason of forest fires and smoke that it was abandoned. In the Alaska trip the Muir glacier was visited, the glaciers in Taku inlet, and the Davidson glacier, in Lynn canal, and many smaller glaciers were seen from the ship's deck. The results of the trip were instructive and suggestive of application in the full interpretation of glacial phenomena in New York, particularly in the Catskill mountain region and in the Adirondack mountains. And the field work, another season, in studying our glacial formations, will have its problems solved by the aid of knowledge acquired on the Pacific slope.

During the latter part of the autumn I have visited the principal cities of the State and have collected statistics of the use of stone in building and in street work, and have obtained from architects and stone dealers much valuable data about the sources, durability, cost and comparative advantages or defects of the stone used in these cities.

Dr. Chas. E. Beecher retains his position on the Museum staff, as Assistant and Consulting Palæontologist.

In the summer he visited Wyoming and South Dakota and secured for the Museum some valuable fossils, minerals and stone implements. He visited Louisville and examined the Nettleroth collection and reported on it. He has examined several other and smaller collections which were offered at sale. His most important service is a paper on the "Development of Some Silurian Brachiopoda," and published as Memoir No. 1. Mr. John M. Clarke, Assistant State Palæontologist, was conjointly with him author of this paper.

Wm. B. Marshall, Assistant in Zoölogy, has charge of the department of Zoölogy and the care of its collections. He has given much time to their rearrangement and to the general improvement of the exhibition of the material on the top floor of the Museum. He has relabeled the birds, following the order in Ridgway's "Manual of North American Birds;" mounted the Beecher collection of shells; and rearranged nearly all of the collections in the room. A study of the Unionidæ of Albany county has yielded some valuable data concerning the markings on the beaks of these fresh-water shells, and important generalizations have been drawn therefrom, which he has brought together in a paper, to be published as a Museum bulletin. The records of

accessions have been kept by him; and the general clerical work of the Museum has taken much of his time and he has been in charge during my absence.

Martin Sheehy has been employed in the laboratory making transparent and microscopic sections and also as general helper in all of the departments of the Museum. The rapidity with which rock sections are now cut, by new diamond saws, constructed by him, reduces the time greatly and increases the capacity of the laboratory. On account of the many calls for his help in the work of museum exhibition, the actual output is less than formerly. Sections for the study of fossil shell structure by the State Palæontologist have been made; and many of building stones for the department of economic geology.

ARRANGEMENT AND ACCESSIONS.

Mineralogical Collections.

The mineralogical rooms on the principal floor of the Museum remain essentially as their arrangement was reported for 1888. The general collection is exhibited in these rooms and in wall cases and table cases. The system of Dana's mineralogy is followed, in the arrangement in the wall cases, Nos. 1-26, inclusive; in case 27, the Emmons collection of calcites from Rossie, St. Lawrence county, is exhibited. In case 28, the petroleum collection, received from Professor John J. Stevenson, of New York city, is arranged. The more valuable and better crystallized specimens of nearly all of the mineral species represented in the general collection, occupy a table case in the front room. The Bergen Hill minerals fill a case in the rear room. The collection of gems and cut stones are shown in a case in the same room, placed in the front of a window so as to be well lighted. In another window-case in this room a large mass of green fluor spar from Macomb, St. Lawrence county is on exhibition. A new table-case has been placed in the front room and in it is displayed the beautiful collection of ornamental marbles and serpentines, the gift of Messrs. S. Klaber & Co., of 47 West Forty-second street, New York. It consists of forty-four dressed and polished blocks, representing the most valued and best known marbles and serpentines for ornamental work from Algeria, Spain, France, Italy, Belgium, Great Britain, Mexico and our own country. There are in the collection two marbles from New

York quarries. The beauty of the specimens attracts all visitors and they make one of the most important accessions of the year.

The minerals from Manhattan or New York island and from Westchester county, purchased last year, have been arranged in the first table case in the front room. One hundred and thirty specimens, and thirty-eight species make up this collection. The orthoclase, beryl, tourmaline and muscovite are notable for their crystalline forms, and the comparatively rare dumortierite and xenotime, the latter well crystallized, attract the attention of mineralogists. As a representative of the variety and excellence of mineral species, which occur on New York island, the collection is interesting and it is valuable since many of the localities have already been covered by buildings and lost to mineral collectors.

GEOLOGICAL AND PALEONTOLOGICAL COLLECTIONS.

Few changes have been made in the arrangement of the palæontological collections in the rooms on the second and third floors of the Museum building. A large flag-stone, taken from the sidewalk in front of the Sherman Free Library at Port Henry, ripple-marked and crossed by the trails of an unknown crustacean, has been set up, so that it can be seen to the best advantage and studied by specialists interested in these fossil footprints. A full notice of the discovery of this slab and of the associated material, obtained from the same quarry, was given in the last annual report. (Pp. 25-34.)

The largest addition on this floor is the collection of sandstone, with footprints and structural markings, from Turner's Falls, Massachusetts. There are six slabs. One of them has two three-toed tracks, having a length of stride of three feet. A pair of slabs show the mud cracks and foot impressions and the cast of the same on the lower and upper surfaces respectively. On a smaller slab there are numerous smaller footprints and representing several animal forms. One slab, three and one-half feet by two feet, shows extraordinarily well preserved ripple-marks and one obscure footprint. The sixth slab exhibits finely a bit of the old beach history, in its footprints, partly obscured and indented by the rain, which was subsequent to the passage of the animal, and the later wind-drifted sand, covering raindrops and footprint alike with fine sand lines. The collection is an important

exhibit of the characteristic markings of the bed surfaces in this Triassic sandstone, as well as an instructive addition, illustrating the more common conditions attendant upon the deposition of strata.

In order to make room for the increase of geological and palæontological material, a third table case has been set up on the third floor. It is shallow, and the heavy sash frames shut out some light in the poorest lighted part of the room, but it serves temporarily to hold the Rosenbusch collection of massive rocks and some European Mesozoic and Tertiary invertebrate fossils. The Rosenbusch collection consists of 500 specimens, trimmed to uniform size and numbered in conformity with the typical collection of Professor Rosenbusch and designated by the names, which he now uses in his "*Mikroskopische Physiographie der Massige Gesteinen.*" It will serve as a valuable aid in the study of the crystalline rocks, whose outcrops form so large an area of our State, as also an important illustrative collection to teachers and students of petrography.

The iron ores collected in 1888, and in part obtained through the generous assistance of mine owners and managers, have been arranged and mounted with appropriate labels, in a wall case against the front wall of the room on the third floor. There are 140 specimens in this collection. Want of space made it necessary to select the more characteristic ores and from the larger mines in the several iron-ore districts of the State. The remainder of the material, thus gathered, will be packed in drawers in the State Hall. According to the present arrangement in this story, the minerals of the State, the collection of brines, salt and related products of the salt industry and the iron ores occupy the wall cases of the western half of the room, and in consecutive order.

ZOOLOGICAL DEPARTMENT.

The work of rearranging the Zoölogical collections has been continued during the year. The shelving in three wall cases has been altered to give more space for the exhibition of the alcoholic collection, the sponges, the corals and the reptiles and amphibians. A raised platform has been put in the southern section of the east side wall case. The floor cases and table cases remain in the same position as they had last year. A female kangaroo, mounted with young in pouch, purchased from Ward of Rochester,

has been added and placed with the opossum and duck-bill in the middle section of the east side wall case. It attracts attention as one of the largest of marsupial mammals and it is an important step in the line of a synoptic collection. The seals have been put in the case of carnivorous mammals in the south section of the east side wall case. The walrus, giraffe and hippopotamus occupy the northern half of this wall case.

The collection of skeletons has been rearranged in a floor case on the western side of the room and relabeled. There have been added to it during the year the following: flying squirrel, crow, flicker, loon, wild turkey and great blue heron.

The collection of stuffed birds has been studied carefully, relabeled and arranged according to the order of Ridgway's "Manual of North American Birds." Printed labels giving the common and the Latin names and the habitat have been placed on all of the specimens. The sex and season represented by the plumage have been added whenever known. In many cases the name of donor and place of capture were not stated on the old labels, and these important facts can not be given. During the year there have been added, by purchase, 106 specimens, representing fifty-four species, new to the collection. The collection has been enriched by the gift of Erastus Corning, Jr., consisting of seventy-eight specimens of beautifully mounted and valuable birds, the list of which appears in its proper place in the appendix.

The collection of birds eggs has been rearranged and enlarged by the addition of seventy-eight eggs, new to it, purchased from Ward, of Rochester, and another lot, representing sixty species, from W. S. Simpson, to complete suites already in it. There are many deficiencies and many of them are difficult to fill, owing to the comparative scarcity of specimens and the doubtful identification of species.

The stuffed reptiles and amphibians have been brought together in a wall case on the northeast corner. The new shelving admits of a better exhibition and with new labels the whole case is much improved.

The collection of echinoderms, which was formerly in the window case, near the east end of the room, has been expanded so as to occupy that case and the corresponding one at the west front window. A few glass models have been incorporated in their

proper places in the collection. They show the more delicate structure and colors of the animal forms which are not easily preserved.

Twenty-seven specimens of corals, purchased from H. T. Woodman, of New York city, have been mounted on walnut pedestals and placed on exhibition in a wall case on the front. The sponges occupy a part of the case.

A thorough examination of the alcoholic collection was made early in the year and the percentage of alcohol was found in some cases as low as thirty per cent, and in nearly all down to fifty per cent. The alcohol was taken out, filtered and brought up to a standard of seventy and the bottles after cleaning, were refilled. The whole collection is now grouped in the two western wall cases, against the south wall.

The work of mounting and rearranging the Beecher collection of fresh-water shells is in progress and they will be in order before the year closes.

The collection of woods of New York State, which purchase was ordered at the Regents' meeting in January last, is being made by Mr. Romeyn B. Hough, of Lowville, Lewis county. He reports that forty-five (45) varieties have already been secured. The whole number to be obtained by him, as per contract, is seventy-four (74). The following letter from Mr. Hough gives the progress made and the probable time of the delivery of the collection.

LOWVILLE, N. Y., November 16, 1889.

MR. JOHN C. SMOCK:

MY DEAR SIR.—In reply to your inquiry of the fifteenth instant I would say that I have now gathered specimens of forty-five species of our New York State timbers. Others I intend getting soon and trust I shall have them all in time.

The seasoning of these specimens I find requires considerable time, and hence they can not be finished for museum display this year. They are under shelter and doing perhaps as well as can be, letting nature take her own course, and will be finished up for the Museum as soon as it seems advisable. I hope they will then make a handsome display of our forest wealth in that line.

Very respectfully.

ROMEYN B. HOUGH.

LIBRARY.

The library of the Museum was removed to the State Library in the Capitol May 10, 1888, since which date it has been placed in one of the alcoves of that library. The record of additions, found in the appendix, is for the period November 20, 1887, to May 10, 1888.

BULLETINS AND MEMOIRS.

The publication of bulletins has been continued and there have appeared during the year the following: No. 7. "First Report on Iron Mines and Iron-ore Districts of the State of New York," by John C. Smock, and "The Boleti of the United States," by Chas. H. Peck. A series of memoirs has been started; and No. 1 of Vol. 1. on "The Development of Some Silurian Brachiopoda," by Charles E. Beecher and John M. Clarke, was issued in October. It is proposed to put the more purely scientific papers of the Museum staff in the form of memoirs and the more practical and shorter ones in the ordinary octavo form adopted for the bulletins. The demand for the bulletins has been large and their issue in this convenient shape for use meets the popular want and makes them serviceable. The larger quarto size of the memoirs is suited to illustrations on plates of larger size, required in scientific reports. The bulletin on the iron ores of the State embodies the results of the field work of 1888, which was continued until near the end of the year. Descriptions of the several iron-ore districts are given in the first part of this report. Notes of the mines in these districts with names of owners and lessees, and statistics of production follow the general descriptions of the districts. The demand for this bulletin has been met by a free distribution to all applicants in the State and to many outside of its limits, who are engaged in the iron manufacture, or are studying the subject of iron-ore deposits.

In the last annual report there was a reference to the proposed issue of a second bulletin on our building stone. The preparations for it have been in progress during a part of the year. The data needed for it are nearly all in hand; the specimens for the series of chemical and physical tests have been collected by Prof. F. A. Wilber, of New Brunswick, N. J., and the work of testing these specimens has been nearly all done by him. The results of his examinations will be ready within a month from date, and will be incorporated with other examinations and notes on the use of

stone as a constructive material in our cities, in a second bulletin on building stone. It can be ready for the press sometime in the winter:

The publication of similar bulletins upon the limestones, cements, brick-clays, salt deposits, petroleums, natural gas and other mineral staples, which are found within the limits of the State, is desired greatly, not only by those who are engaged directly in their development but by all of our citizens who are interested in the industrial progress of the people and in contributions to our material comfort and prosperity. The most serious want felt in the preparation of these bulletins devoted to our economic geology, are better maps to show the occurrences and the localities where the ores, limestones, clays, building stones, salt, gas, etc., are to be found. The imperfect county maps are ill suited to show the geological limits of the formations in which these natural products occur. Another and even more urgent need is room in the Museum for the proper exhibition of the collections from our mines, quarries and clay pits. Well-selected and representative collections can not be shown, whereas in a State Museum there ought to be specimens from every locality, so that the visitor seeking information on any point can find the full list and specimens from all of the localities therein mentioned. The exhibition should contain all that is referred to or described in its publications.

SCHOOL COLLECTIONS.

Collections of minerals have been sent to the following institutions of learning in the State:

State Normal and Training School, Buffalo.

Gloversville Union School, Gloversville, Fulton county.

Academy, West Winfield, Herkimer county.

High School, Flushing, Long Island.

St. Peter's Academy, Troy.

Glens Falls Union School, Glens Falls.

Waterloo Union School, Waterloo, Seneca county.

VISITORS AND GUIDE BOOKS.

The Museum is open to the public daily, except Sundays, from 9 A. M. to 6 P. M., in the summer, and to 5 P. M., in the winter. No register or record of the number of visitors is kept. The average

daily number is increasing from year to year, varying, however, greatly in the different seasons and determined somewhat by the condition of the weather. Many teachers have visited the Museum the past year and some of them have brought their geological classes with them. Occasionally the building is thronged by excursion parties visiting the capital city. The lack of small hand-books or guides is a serious drawback to the usefulness of the collections. The crowded condition of the cases also deters many visitors from the attempt to examine, even if it were possible, the collections in the mineralogical and geological rooms. At present it is impossible to arrange the material on exhibition in such consecutive order as to show the proper relations of groups and classes of objects and make them instructive in the highest degree.

Want of space in the cases will not admit of any additional collections, or even many individual specimens. The zoölogical room is particularly well filled and needing more space. A large amount of palæontological material is stored in the State Hall, partly, however, for better security there, in a fire-proof building. The collection illustrative of dynamical and stratigraphical geology is packed in cases in the basement. The economics also are, in great part, stored in boxes and cases in the Geological Hall and some in the mineral room in the State Hall. That all these collections should be on exhibition in a State Museum is self-evident. Of the importance of room for the full exhibition of specimens from all localities of occurrence in the State, particularly in minerals of economic importance it is not necessary to write more. The subject was referred to in the last annual report. The value of the Museum collections as educational material suggests a general rearrangement or enlarged accommodations.

Respectfully submitted.

JOHN C. SMOCK.

ADDITIONS TO THE COLLECTIONS.

I. ZOOLOGY.

By DONATION.

Erastus Corning, Jr., Albany, N. Y.:

- Two specimens Red Squirrel (*Sciurus hudsonius*, Pall.).
- One specimen Raccoon (*Procyon lotor*, Linn.).
- One specimen Holboëll's Grebe (*Colymbus holboëllii*, Reinh.).
- One specimen Loon (*Urinator imber*, Gunn.).
- One specimen Old Squaw (*Clangula hyemalis*, Linn.).
- One specimen American Merganser (*Merganser americanus*, Cass.).
- One specimen Hooded Merganser (*Lophodytes cucullatus*, Linn.).
- One specimen Mallard (*Anas boschas*, Linn.).
- One specimen Baldpate (*Anas americana*, Gm.).
- Two specimens Green-Winged Teal (*Anas carolinensis*, Gm.).
- Two specimens Blue-Winged Teal (*Anas discors*, Linn.).
- One specimen Pintail (*Dafila acuta*, Linn.).
- One specimen American Golden-Eye (*Glaucionetta clangula americana*, Bonap.).
- One specimen Black-Crowned Night Heron (*Nycticorax nycticorax nævius*, Bodd.).
- One specimen Sora Rail (*Porzana carolina*, Linn.).
- One specimen American Woodcock (*Philohela minor*, Gm.).
- One specimen Wilsons Snipe (*Gallinago delicata*, Ord.).
- One specimen Greater Yellow-Legs (*Totanus melanoleucus*, Gm.).
- Two specimens Bob White (*Colinus virginianus*, Linn.).
- One specimen Prairie Hen (*Tympanuchus americanus*, Reich.).
- One specimen Heath Hen (*Tympanuchus cupido*, Linn.).
- One specimen Scaled Dove (*Scardafella squamosa*, Temm.).
- Two specimens American Goshawk (*Accipiter atricapillus*, Wils.).
- One specimen Red-shouldered Hawk (*Buteo lineatus*, Gm.).
- One specimen Broad-winged Hawk (*Buteo latissimus*, Wils.).
- One specimen American Osprey (*Pandion haliaetus carolinensis*, Gm.).
- One specimen Barred Owl (*Syrnium nebulosum*, Forst.).
- One specimen Saw-whet Owl (*Nyctala acadica*, Gm.).

- One specimen Screech Owl (*Megascops asio*, Linn.).
- One specimen Hairy Woodpecker (*Dryobates villosus*, Linn.).
- One specimen Downy Woodpecker (*Dryobates pubescens*, Linn.).
- One specimen Horred Lark (*Otocoris alpestris*, Linn.).
- One specimen Blue Jay (*Cyanocitta cristata*, Linn.).
- One specimen American Crow (*Corvus americanus*, Aud.).
- One specimen Bobolink (*Dolichonyx oryzivorus*, Linn.).
- Two specimens Cowbird (*Moluthrus ater*, Bodd.).
- One specimen Meadow Lark (*Sturnella magna*, Linn.).
- One specimen Baltimore Oriole (*Icterus galbula*, Linn.).
- Two specimens Rusty Blackbird (*Scolecophagus carolinus*, Müll.).
- One specimen American Cross-bill (*Loxia curvirostra minor*, Brehm).
- Two specimens Redpoll (*Acanthis linaria*, Linn.).
- One specimen American Goldfinch (*Spinus tristis*, Linn.).
- One specimen Snowflake (*Plectrophenax nivalis*, Linn.).
- One specimen White-throated Sparrow (*Zonotrichia albicollis*, Gm.).
- One specimen Tree Sparrow (*Spizella monticola*, Gm.).
- One specimen Summer Tanager (*Piranga rubra*, Linn.).
- One specimen Cedar Waxwing (*Ampelis cedrorum*, Vieill.).
- Two specimens Northern Shrike (*Lanius borealis*, Vieill.).
- Two specimens Water Thrush (*Seiurus nove boracensis*, Gm.).
- One specimen Mockingbird (*Mimus polyglottos*, Linn.).
- One specimen Catbird (*Galeoscoptes carolinensis*, Linn.).
- One specimen Wood Thrush (*Turdus mustelinus*, Gm.).
- One specimen Olive-backed Thrush (*Turdus ustulatus swainsonii*, Cab.).
- Two specimens American Robin (*Merula migratoria*, Linn.).
- One specimen Bluebird (*Sialia sialis*, Linn.).
- One specimen King Bird of Paradise (*Cicinnurus reg.*).
- One specimen Golden Trogon (*Trogon pavonius*).
- Thirteen specimens Birds (sp. indet.).
- One specimen Snapping Turtle (*C. serpentina*, L.).
- Twenty-five specimens Snakes and Lizards (unidentified).

E. N. Leslie, Skaneateles, N. Y.:

- One specimen White-footed Mouse (*Hesperomys leucopus*, Le C.), captured in the dwelling of the donor.

Mrs. J. C. Van Horne, Shasta county, Cal. :

- One specimen Barnacle, taken from the back of a whale, coast of California.

Professor James Hall :

- One specimen Forster's Shrew (*Sorex forsteri*), Albany, N. Y.

BY PURCHASE.

The head of a Prong-horn Antelope from Western North America.

Ward & Howell, Rochester, N. Y.

One specimen Giant Kangaroo (*Macropus giganteus*), mounted with a pair of young in the pouch. From Victoria, Australia.

Mounted skeletons, as follows:

One specimen Flying Squirrel (*Sciuropterus volucella*), ♂, New York.

One specimen Northern Loon (*Urinator imber*, Gunn.), Fall River, Mass.

One specimen Gt. Blue Heron (*Ardea herodias*, L.), Florida.

One specimen Wild Turkey (*Meleagris gallopavo*, L.), ♂, Michigan.

One specimen Flicker (*Colaptes auratus*, L.), ♀, Illinois.

One specimen Crow (*Corvus Americanus*, Aud.), Wayne county, N. Y.

Mounted birds, as follows:

Puffin (<i>Fratercula arctica</i> , L.).....	{	♂ Cape Whittleby.
	{	♀ Cape Whittleby.
Mandt's Guillemot (<i>Cepphus Mandtii</i> , Licht.)	{	♂ Cumberland Sound.
	{	♀ Alaska.
Brunnich's Murre (<i>Uria lomvia</i> , L.).....	{	♂ South Bristol, Me.
	{	♀ Plymouth, Mass.
Long-tailed Jaeger (<i>Stercorarius longicaudus</i> , Vieill.)	{	♂ Alaska.
	{	♀ Alaska.
Kittwake (<i>Rissa tridactyla</i> , L.).....	{	♂ North Atlantic.
	{	♀ North Atlantic.
Glaucus Gull (<i>Larus glaucus</i> , Brünn).....	{	♂ Maine.
	{	♀ Maine.
Gull-billed Tern (<i>Gelochelidon nilotica</i> , Hass).....	{	♂ Padry Is., Tex.
	{	♀ Padry Is., Tex.
Caspian Tern (<i>Sterna tschegreva</i> , Lepech.) .	{	♂ California.
	{	♀ Padry Is., Tex.
Royal Tern (<i>Sterna maxima</i> , Bodd.).....	{	♂ Padry Is., Tex.
	{	♀ Padry Is., Tex.
Cabot's Tern (<i>Sterna sandvicensis acuflava</i> , Cab.)	{	♂ Padry Is., Tex.
	{	♀ Padry Is., Tex.
Forster's Tern (<i>Sterna forsteri</i> , Nutt.).....	{	♂ Cobb's Is., Va.
	{	♀ Eagle Lake, Cal.
Arctic Tern (<i>Sterna paradisea</i> , Brünn.)	{	♂ St. Michael's, Alaska.
	{	♀ St. Michael's, Alaska.
Roseate Tern (<i>Sterna dougalli</i> , Montag.) ...	{	♂ Padry Is., Tex.
	{	♀ Padry Is., Tex.
Least Tern (<i>Sterna antillarum</i> , Less.).....	{	♂ Texas.
	{	♀ Padry Is., Tex.
Sooty Tern (<i>Sterna fuliginosa</i> , Gm.)	{	♂ Padry Is., Tex.
	{	♀ Bahamas.

Stormy Petrel (<i>Procellaria pelagica</i> , L.)....	{ ♂ + ♀	North Atlantic. North Atlantic.
Gannet (<i>Sula bassana</i> , L.)	{ ♂ + ♀	Bird Rocks. Bird Rocks.
Brown Pelican (<i>Pelecanus fuscus</i> , L.).....	{ ♂ + ♀	Texas. Texas.
Cormorant (<i>Phalacrocorax carbo</i> , L.).....	{ ♂ + ♀	Maine. Maine.
Barrows' Golden Eye (<i>Glaucionetta islandica</i> , Gm.).....	{ ♂ + ♀	Kodiak. Maine.
White-winged Scoter (<i>Oidemia deglandi</i> , Bonap.).....	{ ♂ + ♀	Conesus Lake, N. Y. Kodiak.
American Egret (<i>Ardea egretta</i> , Gm.).....	{ ♂ + ♀	Miahka, Fla. Miahka, Fla.
Red Phalarope (<i>Crymophilus fulicarius</i> , L.)	{ ♂ + ♀	St. Michael's, Alaska. St. Michael's, Alaska.
Wilson's Phalarope (<i>Phalaropus tricolor</i> , Vieill.)	{ ♂ + ♀	Larimer Co., Col. Colorado.
Purple Sandpiper (<i>Tringa maritima</i> , Brünn.)	{ ♂ + ♀	St. Michael's, Alaska St. Michael's, Alaska
Bonapartes Sandpiper (<i>Tringa fuscicollis</i> , Vieill.)	{ ♂ + ♀	Frogmore, S. C. South Carolina.
Baird's Sandpiper (<i>Tringa bairdi</i> , Coues)...	{ ♂ + ♀	Larimer Co., Col. Larimer Co., Col.
Red-backed Sandpiper (<i>Tringa alpina pacifica</i> , Coues).....	{ ♂ + ♀	Padry Is., Tex. Padry Is., Tex.
Western Sandpiper (<i>Ereunetes occidentalis</i> , Lawr.)	{ ♂ + ♀	Larimer Co., Col. Larimer Co., Col.
Wilson's Plover (<i>Ægialites wilsonia</i> , Ord.)..	{ ♂ + ♀	Northampton Co., Va. Northampton Co., Va.
Willow Ptarmigan (<i>Lagopus lagopus</i> , L.)..	{ ♂ + ♀	St. Michael's, Alaska. Kegiktownik, Alaska.
Marsh Hawk (<i>Circus hudsonius</i> , L.).....	{ ♂ + ♀	Texas. Ft. Reliance, Alaska.
Gray Gyrfalcon (<i>Falco rusticolus</i> , L.)	{ + ♀	
American Osprey (<i>Pandion haliaëtus carolinensis</i> , Gm.)	{ ♂ + ♀	Alaska. Fox Island, Mo.
American Barn Owl (<i>Strix pratincola</i> , Bonap.)	{ ♂ + ♀	Texas. Texas.
American Three-toed Woodpecker (<i>Picoides americanus</i> , Brehm.)	{ ♂ + ♀	Location unknown. Maine.
Phoebe (<i>Sayornis phoebe</i> , Lath.).....	{ ♂ + ♀	Rhode Island. Rhode Island.
Yellow-bellied Flycatcher (<i>Empidonax flaviventris</i> , Baird)	{ ♂ + ♀	Pennsylvania. Pennsylvania.

Acadian Fly-catcher (<i>Empidonax acadicus</i> , Gm.)	{ ♂ Warsaw, Ill. ♀ Philadelphia, Pa.
Ipswich Sparrow (<i>Ammodramus princeps</i> , Mayn.)	{ ♂ Massachusetts. ♀ Massachusetts.
Lincolns Sparrow (<i>Melospiza lincolni</i> , Aud.)	{ ♂ Warsaw, Ill. ♀ Warsaw, Ill.
Bank Swallow (<i>Clivicola riparia</i> , L.)	{ ♂ Warsaw, Ill. ♀ Illinois.
Rough-winged Swallow (<i>Stelgidopteryx serripennis</i> , Aud.)	{ ♂ Warsaw, Ill. ♀ Virginia.
White-rumped Shrike (<i>Lanius ludovicianus excubitorides</i> , Sw.)	{ ♂ Texas. ♀ Brownsville, Tex.
Philadelphia Vireo (<i>Vireo philadelphicus</i> , Cass.)	{ ♂ Illinois. ♀ Cook Co., Ill.
Yellow-throated Warbler (<i>Dendroica dominica</i> , L.)	{ ♂ Charlestown, S. C. ♀ Charlestown, S. C.
Yellow Palm Warbler (<i>Dendroica palmarum hypochrysea</i> , Ridg.)	{ ♀ Massachusetts.
Louisiana Water Thrush (<i>Seiurus motacilla</i> , Vieill.)	{ ♂ Warsaw, Ill. ♀ Rhode Island.
American Pipit (<i>Anthus pennsylvanicus</i> , Lath.)	{ ♂ Warsaw, Ill. ♀ Warsaw, Ill.
Red-breasted Nuthatch (<i>Sitta canadensis</i> , L.)	{ ♂ Pennsylvania. ♀ Hastings, N. Y.
Hudsonian Chickadee (<i>Parus hudsonicus</i> , Forst.)	{ ♂ Reliance, Alaska. ♀ Campbellton, N. B.
Gray-cheeked Thrush (<i>Turdus aliciae</i> , Baird.)	{ ♂ Iowa. ♀ Warsaw, Ill.
Bicknell's Thrush (<i>Turdus aliciae bicknelli</i> , Ridgw.)	{ ♂ Hancock Co., Ill. ♀ Hancock Co., Ill.
Wheatear (<i>Saxicola œnanthe</i> , L.)	{ ♂ Maine. ♀ Maine.

Birds' eggs as follows:

Two specimens Kittiwake (*Rissa tridactyla*, L.), Labrador.

Two specimens Great Black-backed Gull (*Larus marinus*, L.), Labrador.

Two specimens Ring-billed Gull (*Larus delawarensis*, Ord), Labrador.

Two specimens Gull-billed Tern (*Gelochelidon nilotica*, Hasselq.), Cobb's Island, Va.

Two specimens Caspian Tern (*Sterna tschegreva*, Lepech.), California.

Two specimens Royal Tern (*Sterna maxima*, Bodd.) Loc?

Two specimens Cabot's Tern (*Sterna sandvicensis aculeiflvida*, Cab.), Texas.

Two specimens Common Tern (*Sterna hirundo*, L.), Virginia.

- Two specimens Roseate Tern (*Sterna dougalli*, Montag.), Guilford, Conn.
- Two specimens Black Tern (*Hydrochelidon nigra surinamensis*, Gm.) Bahamas.
- One specimen Fulmar (*Fulmarus glacialis*, L.), Loc?
- One specimen Stormy Petrel (*Procellaria pelagica*, L.), Faroe Island.
- Two specimens Double-crested Cormorant (*Phalacrocorax dilophus*, Sw. and R.), Loc?
- Two specimens Brown Pelican (*Pelicanus fuscus*, L.), Florida.
- Four specimens Red-breasted Merganser (*Merganser serrator*, L.), Iowa.
- Three specimens Shoveller (*Spatula clypeata*, L.), Franklin county, Iowa.
- Two specimens Wood Duck (*Aix sponsa*, L.), Franklin county, Iowa.
- Four specimens Red-head (*Aythya americana*, Eyt.), Franklin county, Iowa.
- Four specimens American Eider (*Somateria dresseri*, Sharpe), Hudson Bay.
- Two specimens Ruddy Duck (*Erismatura rubida*, Wils.), Colorado.
- Two specimens American Egret (*Ardea egretta*, Gm.), Texas.
- One specimen American Egret (*Ardea egretta*, Gm.), Savannah, Ga.
- Three specimens Black-crowned Night Heron (*Nycticorax nycticorax naevius*, Bodd.), Texas.
- Two specimens Yellow-crowned Night Heron (*Nycticorax violaceus*, L.), Jefferson county, Texas.
- Four specimens Sora Rail (*Porzana carolina*, L.), Cook county, Ill.
- Three specimens Corn Crake (*Crex crex*, L.), Loc?
- Two specimens Purple Gallinule (*Ionornis martinica*, L.), Jefferson county, Texas.
- Four specimens Florida Gallinule (*Gallinula galeata*, Licht.), Lake Worth, Fla.
- Two specimens American Coot (*Fulica americana*, Gm.), Le Roy, Wis.
- Three specimens Ruff (*Pavoncella pugnax*, L.), Loc.?
- Five specimens Bob White (*Colinus virginianus*, L.), Virginia.
- One specimen Sharp-shinned Hawk (*Accipiter velox*, Wils.), Wiscassett, Me.
- One specimen Sharp-shinned Hawk (*Accipiter velox*, Wils.), Exeter, N. H.
- One specimen Sharp-shinned Hawk (*Accipiter velox*, Wils.) Wiscassett, Me.
- Three specimens Cooper's Hawk (*Accipiter cooperi*, Bonap.), Pennsylvania.
- Two specimens Red-tailed Hawk (*Buteo borealis*, Gm.), Auburn, N. Y.

- One specimen Red-shouldered Hawk (*Buteo lineatus*, Gm.), Wayne county, N. Y.
- Two specimens American Osprey (*Pandion haliaëtus carolinensis*, Gm.), Seabright, N. J.
- Three specimens American Barn Owl (*Strix pratincola*, Bonap.), Iowa.
- Three specimens Burrowing Owl (*Speotyto cunicularia hypogæa*, Bon.), California.
- Two specimens Yellow-bellied Sap-sucker (*Sphyrapicus varius*, L.), Iowa.
- Four specimens Red-headed Woodpecker (*Melanerpes erythrocephalus*, L.), Penfield, N. Y.
- Three specimens Red-bellied Woodpecker (*Melanerpes carolinus*, L.), Iowa.
- Four specimens Phoebe (*Sayornis phoebe*, Lath.), Penfield, N. Y.
- Three specimens Acadian Fly-catcher (*Empidonax acadicus*, Gm.), Alledo, Ill.
- Three specimens Traill's Fly-catcher (*Empidonax pusillus trailli*, Aud.), Illinois.
- Three specimens Least Fly-catcher (*Empidonax minimus*, Baird), Dighton, Mass.
- Four specimens Horned Lark (*Otocoris alpestris*, L.), Santa Cruz, Cal.
- Four specimens Bronzed Grackle (*Quiscalus quiscula æneus*, Ridgw.), Vicksburg, Miss.
- Three specimens Purple Finch (*Carpodacus purpureus*, Gm.), Pomona, Cal.
- Four specimens Grasshopper Sparrow (*Ammodramus savannarum passerinus*, Wils.), Pennsylvania.
- Two specimens Seaside Sparrow (*Ammodramus maritimus*, Wils.), Connecticut.
- Two specimens White-throated Sparrow (*Zonotrichia albicollis*, Gm.), Rutland, Vt.
- Three specimens Slate-colored Junco (*Junco hyemalis*, L.), Houlton, Maine.
- Three specimens Swamp Sparrow (*Passerella georgiana*, Lath.), Canandaigua, N. Y.
- Three specimens Rose-breasted Grosbeak (*Habia ludoviciana*, L.), Marshall, Mich.
- Three specimens Indigo Bunting (*Passerina cyanea*, L.), Pelham, N. Y.
- Four specimens Black-throated Bunting (*Spiza americana*, Gm.), Iowa.
- Three specimens Summer Tanager (*Piranga rubra*, L.), St. Augustine, Florida.

Three specimens Scarlet Tanager (*Piranga erythromelas*, Vieill.), New Jersey.

Three specimens Loggerhead Shrike (*Lanius ludovicianus*, L.), Summerfield, Mich.

Four specimens White-rumped Shrike (*Lanius ludovicianus excubitorides*, Sw.), California.

Four specimens Red-eyed Vireo (*Vireo olivaceus*, L.), Maine.

Three specimens Yellow-throated Vireo (*Vireo flavifrons*, Vieill.) Medford, Mass.

Two specimens Blue-headed Vireo (*Vireo solitarius*, Wils.), Loc.?

Two specimens Black and White Warbler (*Mniotilta varia*, L.), Loc.?

Three specimens Parula Warbler (*Compsothlypis americana*, L.), Mass.

Four specimens Chestnut-sided Warbler (*Dendroica pennsylvanica*, L.), Easton, Mass.

Four specimens Yellow-breasted Chat (*Icteria virens*, L.), St. Louis, Missouri.

Four specimens American Redstart (*Setophaga ruticilla*, L.), Hawk county, Iowa.

Four specimens Mocking Bird (*Mimus polyglottos*, L.), Colorado.

Four specimens Brown Thrasher (*Harporhynchus rufus*, L.), Penfield, N. Y.

Three specimens Carolina Wren (*Thryothorus ludovicianus*, Lath.), Charleston, S. C.

Two specimens White-breasted Nuthatch (*Sitta carolinensis*, Lath.), Nazareth, Penn.

Two specimens Blue-gray Gnat-catcher (*Polioptila cærulea*, L.), Marshall, Mich.

Four specimens Woodthrush (*Turdus mustelinus*, L.), Canandaigua, N. Y.

Three specimens Wilson's Thrush (*Turdus fuscescens*, Steph.), Roxbury, Mass.

One specimen Wilson's Thrush (*Turdus fuscescens*, Steph.), Loc.?

Four specimens Dwarf-hermit Thrush (*Turdus aonalaschkæ*, Gm.), Rutland, Vt.

W. S. Simpson:

Sixty species of bird's eggs (completing suites already in the collection).

H. T. Woodman:

Ten specimens *Agaricia agaricites*, West Indies.

One specimen *Millepora alcicornis*, West Indies.

One specimen *Nullipora* (a plant), West Indies.
 Five specimens indet, West Indies.
 One specimen *Eusmilia fastigiata*, Bahamas.
 Two specimens *Pocillipora* sp.? East Indies.
 One specimen *Alveopora spongiosa*, Singapore.
 One specimen *Herpetolithes limax*, Singapore.
 Four specimens *Madrepora plantaginea*, Singapore.
 One specimen *Madrepora* sp.? Zanzibar.
 Three specimens *Oreaster gigas*, West Indies.

II. MINERALOGY AND ECONOMIC GEOLOGY.

By DONATION.

Horace L. Wells, New Haven, Conn.:
 Sperrylite from Vermilion Mine, Ontario, Canada.

Harry S. Peck, Albany:
 One specimen of Diaspore, Chester, Mass.

D. Lynch, Minerva, Essex county:
 Garnet, Minerva Mine.

Rodney West, Minerva, Essex county:
 Garnet from Minerva Mine.

By EXCHANGE.

William W. Jefferis, No. 1836 Green street, Philadelphia, Penn.:
 A collection of 100 minerals, including fine specimens of Jefferisite,
 West Town, Chester county, Pa.

Fibrolite, Brandy-wine Springs, Del.
 Vermiculite, Nottingham, Chester county, Pa.
 Cyanite, E. Brandford, Chester county, Pa.
 Cyanite, E. Bradford, Chester county, Pa.
 Chesterlite, poor-house quarry, Chester county, Pa.
 Muscovite, Pennsbury, Chester county, Pa.
 Pyrite, E. Whiteland, Chester county, Pa.

Moritz Fischer, curator, Kentucky Geological Survey, Frankfort,
 Ky., three specimens, fluorspar, Stamping Ground, Scott county, Ky.

Geological survey of New Jersey:
 One specimen of Chalcophanite, Ogdensburg, N. J.
 One specimen of Zincite, Ogdensburg, N. J.
 Two specimens of Serpentine and Chrysotile, from Montville, N. J.
 Vivianite, from Shrewsbury, N. J.
 Glauconite, New Jersey Greensand Marl Beds.
 Infusorial Earth, from Drakesville, N. J.

American Museum of Natural History, New York :

Four specimens of Malachite, from Copper Queen Consolidated Mine, Arizona.

BY PURCHASE.

T. J. Handforth, 18 William street, New York :

Fluorite, one large group of crystals from Macomb, St. Lawrence county.

Three specimens of Amber, with insects, from Dantzic, Germany.

One specimen of Fire opal, from Bergen Hill, N. J.

L. W. Stillwell, Deadwood, South Dakota :

One specimea Native silver, Black Hills, South Dakota.

One specimen Uranite, Black Hills, South Dakota.

One specimen Cassiterite, Black Hills, South Dakota.

One specimen Barite, Black Hills, South Dakota.

One specimen Tourmaline, Black Hills, South Dakota.

BY COLLECTION.

Five specimens of anthracite, Cascade mines, Anthracite station, Alberta, Canada.

Four specimens of auriferous pyrite from Treadwell gold mine, Douglass island, Alaska.

One specimen of wall rock, Treadwell gold mine, Douglass island, Alaska.

One specimen of rock, typical of large boulders on Muir glacier, Alaska.

Specimens of magnetite (cleavage), Barton Hill mine, Mineville, Essex county.

Lot of magnetite (cleavage specimens), Barton Hill mine, Mineville, Essex county.

One specimen apatite, massive, Barton Hill mine, Mineville, Essex county.

Lot of crystals, apatite, Barton Hill mine, Mineville, Essex county.

One specimen wall rock, pyroxenic, from Little Rapids mine, Buckingham, Quebec, Canada.

One specimen of muscovite, Buckingham, Quebec, Canada.

One specimen of orthoclase, Buckingham, Quebec, Canada.

One specimen of mountain cork, Buckingham, Quebec, Canada.

Two specimens, magnetite in muscovite, Canada.

Charles E. Beecher :

Twenty-five specimens, malachite, azurite and cupreous quartz, Sunrise mine, Laramie county, Wyoming territory.

One specimen native silver, Silver Cliff, Lusk, Wyoming.

Three specimens native gold from Black Hills, Dakota.

ECONOMIC GEOLOGY.

BY DONATION.

S. Klaber & Co., No. 47 West Forty-second street, New York city:
 Forty-four specimens of ornamental marble and serpentine; dressed
 and polished blocks, four and one-half inches by three and one-
 quarter inches by one inch

Algeria, Africa, seven specimens.

France, nine specimens.

Belgium, six specimens.

Italy, nine specimens.

Spain, one specimen.

Great Britain, two specimens.

New York, two specimens.

Pennsylvania, one specimen.

Mexico, five specimens.

Thomas Montague, superintendent Crown Point Iron Company,
 Hammondville, Essex county:

Fourteen specimens magnetic iron ore, from company's mines,
 Hammondville.

Bigelow Blue Stone Company, Malden, Ulster county:
 One block of blue-stone, dressed, nineteen inches by twelve inches by
 twelve inches.

Charles Keeler & Son, Trenton, N. J.:
 One block "Trenton Brown Freestone," six inches by four inches by
 four inches, dressed.

James Gazeley, Menands, Albany county:
 One block of granite from Baire, Vermont, polished, three inches by
 three inches by one and one-half inch.

Burlington Manufacturing Company, Burlington, Vermont:
 Twelve blocks of marble from quarries in New York State.

E. A. Lewald, superintendent Mabopac iron mines, Putnam county:
 Magnetic iron ores from Mabopac iron mine.

A. Cosgriff, Tilly Foster, Putnam county:
 Magnetic iron ores from the Tilly Foster iron mine.

Bennett Perry, of Troy:
 Three specimen blocks of granite from the town of Horicon, Warren
 county.

Jefferson Iron Company, Antwerp, Jefferson county:
 Six specimens of red hematite from mines of company.

Simon Le Fevre, Burden, Columbia county :

Twenty-six specimens of carbonate (iron) ore from No. 2, No. 3 and Mt. Thomas mines, at Burden, Columbia county.

Lewis J. Bailey, Cold Spring, Putnam county :

One block of granite from Breakneck mountain quarry, Putnam county, twelve inches by eight inches by four inches.

Charles G. Slade, Saratoga Spring :

Limestone from Slade's quarry, near Saratoga, six-inch cube, dressed.

E. F. Brennan, Albany :

Granite from South Kent, Conn., one block, dressed.

A. D. Stone & Co., Springfield, Mass. :

One block of Longmeadow brown freestone, five-inch cube.

James & Marra, Springfield, Mass. :

Two blocks of Longmeadow freestone, five-inch cube.

BY EXCHANGE.

Professor Jno. J. Stevenson. University of City of New York :

No. 50. Petroleum, Bridgewater test well, Hancock county, Berea? W. Va.

No. 51. Petroleum, Johnson well, Pleasantville, Venango county, Penn., first and third sands.

No. 52. Petroleum, Beck well, near Pleasantville, Venango county, Penn., first sand.

No. 53. Petroleum, Normal School well, Clarion, Clarion county, Penn., fourth sand.

No. 54. Petroleum, Tarkillfield, Hess, Sacket & Eichner well, Cranberry tp, Venango county, Penn., third sand.

No. 55. Petroleum, Haskill well, near Pleasantville, Venango county, Penn.

No. 56. Petroleum, Cogleyfield, Hess, Sacket & Eichner well, Ashland, Clarion county, third sand.

No. 57. Petroleum, Hall Runfield, Braden farm, Venango county, Penn., gray sand.

No. 58. Petroleum, Clarionfield, Cadwalder 2, Clarion, Penn., third and fourth sands.

No. 59. Petroleum, natural refined oil, Hess, Sacket & Eichner, Reidsburg, Clarion county, Penn.

No. 64. Petroleum, Cameron I, Washington, Penn., fifty-foot sand.

No. 66. Petroleum, Dowley I, Mt. Morris, Greene county, Penn., Vespertime.

- No. 67. Petroleum, Cogleyfield, Hess, Sacket & Eichner, Ashland, Clarion county, Penn., third and fourth sands.
- No. 71. Macksburg, Ohio, first, stray sand, Longfellow & Co., 600 foot sand.
- No. 72. Petroleum, Macksburg, second, stray — 700 foot sand.
- No. 74. Petroleum, Bradshaw well, six miles northwest of New Baltimore, Wood county, Ohio, Trenton Limestone.
- No. 75. Petroleum, Mercer well, four miles north of New Baltimore, Wood county, Ohio, Trenton Limestone.
- No. 76. Petroleum, New Baltimore Gas Company, Wood county, Ohio, Trenton Limestone.
- No. 77. Petroleum, Parker two, Cygnet, Wood county, Ohio, Trenton Limestone.
- No. 78. Petroleum, Parker I, Findlay, Ohio, Lower Silurian,
- No. 80. Petroleum, Jones' Creek, Dickson county, Tenn., Lower Silurian.
- No. 81. Petroleum, Prospecting Company, Nacogdoches, Texas, Tertiary.
- No. 82. Petroleum, Plum Lick Creek, Bourbon County, Ky., Trenton Limestone.
- No. 83. Petroleum, Vinson Company, Blain Creek, Lawrence county, Ky.
- No. 84. Petroleum, Nichol Gas Well, Vanceville, Washington county, Penn, fifty foot sand.
- No. 85. Petroleum, Sulphur boring, Calcasieu Parish, La., Tertiary.
- No. 86. Petroleum, McKeesport Company's well, McKeesport, Penn.

BY COLLECTION.

Professor F. A. Wilber:

- Three blocks of blue-stone, Bigelow Blue Stone Company's quarry, near Malden, Ulster county.
- Two blocks of limestone, Wm. Reilly's quarry, Cobleskill, Schoharie county.
- One block of Sandstone, quarry of Shears and Dunsback, Schenectady.
- Two blocks of limestone, Tribes Hill, Montgomery county, quarry of H. Hurst and Son.
- Three blocks of limestone, Shaper's quarry, Canajoharie, Montgomery county.
- Four blocks of marble (Finch and Pruyn), Glens Falls, Warren county.
- One block of limestone, Sandy Hill, Washington county.
- Twelve blocks of marble and serpentines, Moriah, Essex county, through Burlington Manufacturing Company.
- Four blocks of granite, quarry of the Ausable Granite Company, Keeseville, Essex company.

- One block, sandstone, Potsdam Red Sandstone Company, Potsdam, St. Lawrence county.
- Two blocks of sandstone, Parmeter's quarry, Hammond, St. Lawrence county.
- Two blocks of granite, Grindstone Island, Jefferson county.
- Three blocks of marble, quarry of St. Lawrence Marble Company, Gouverneur, St. Lawrence county.
- One block of limestone, quarry of Adams Bros., Chaumont, Jefferson county.
- Two blocks of limestone, Thomas quarry, Prospect, Oneida county.
- Two blocks of limestone, Splitrock quarries, near Syracuse, Onondaga county.
- Two blocks of Onondaga limestone, Reservation quarries, Onondaga county.
- Two blocks of limestone, Goodrich's quarry, Auburn.
- Two blocks of limestone, P. Smith's quarry, Union Springs, Cayuga county.
- Two blocks of sandstone, Oswego Falls, Oswego county.
- One block of sandstone, quarry of Gilbert Brady, Albion, Orleans county.
- One block of sandstone, O'Brien's quarry, Holley, Orleans county.
- One block of sandstone, Holloway's quarry, Medina, Orleans county.
- Two blocks of blue sandstone, Farman's quarry, Warsaw, Wyoming county.
- One block of sandstone, Pitkin's quarry, Portage, Livingston county.
- One block of sandstone, Chapin & Co.'s quarry, Olean, Cattaraugus county.
- One block of limestone, Fogelsonger's quarry, Williamsville, Erie county.
- One block limestone, Carpenter's quarry, Lockport.
- One block sandstone, Simon's quarry, Elmira.
- Two blocks of sandstone, quarry of Oxford Blue Stone Company, Oxford, Chenango county.

III. GEOLOGY AND PALÆONTOLOGY.

BY DONATION.

F. W. Crosby, Washington, D. C. :

Four specimens of Bent slate from Dutch island, Narragansett bay, R. I.

J. J. Thomas, Union Springs, Cayuga county :

One specimen of Ichthyodorulite (*Machæracanthus major*, Newb.), from the Corniferous Limestone, at Waterloo, Seneca county. Hall, Report on Fourth Dist., N. Y., p. 174.

One specimen of *Arthropycus Harlani*.

BY EXCHANGE.

Charles Wachsmuth, Burlington, Iowa :

Ten specimens of Crinoids from the Kinderhook Group of Marshall county, Iowa.

Charles R. Keyes, Burlington, Iowa :

One hundred and twenty-two specimens of Crinoids.

F. M. Fultz, Burlington, Iowa :

One hundred and twenty-five specimens of Crinoids, etc.

Prof. Daniel Oehlert, Mus. d'Hist. Nat., Laval, Dep't., Mayenne, France :

A collection of fossils, about 500 specimens, and 251 species from the cretaceous and jurassic formations of France.

BY PURCHASE.

T. M. Stoughton, Turner's Falls, Mass. :

One slab of sandstone (5'x2'), with two footprints.

One slab of sandstone (4'x2'), with mud cracks and two footprints.

One slab, cast of above (4'x2').

One slab of sandstone (3½'x2'), with ripple-marks and small footprints.

One slab of sandstone (2' 9"x1' 6"), with rain-drop impressions and small tracks.

One slab of sandstone (1' 4"x1'), with ripple-marks and one footprint.

One slab of sandstone (15"x8"); one (9"x5½"), and one (5½"x4") with structural markings.

John M. Clarke, Albany, N. Y. :

Two hundred and twenty-six specimens of trilobites, from the Schoharie Grit and Lower Helderberg Limestones of Albany county, N. Y., and Square Lake, Maine.

One hundred and thirty-six specimens of trilobites and cirripedes, from the Corniferous Limestone of Ontario county, N. Y.

Nine hundred and twenty-four specimens of trilobites, phyllocarida phyllopoda and cirripedes, from the Hamilton group, various localities in Ontario county, N. Y.

One hundred and eleven specimens of phyllocarida from the Portage and Chemung groups, Ontario, Yates and Livingston counties, N. Y.

Twelve specimens, used for illustration of a paper on the structure of the trilobite eye (Journal of Morphology, 1888, by John M. Clarke.

Thirty-seven specimens of denticles (annelid); used for illustration of a paper on "Annelid teeth," 1887.

Fifteen specimens of brachiopoda, from Corniferous and Hamilton groups, of New York.

Crinoidea.—The original specimens of two species, described by Prof. H. S. Williams of Cornell University, in Proceedings of Academy of Natural Sciences, Philadelphia, 1882; seven figured specimens (two of new species), utilized by Wachsmuth & Springer for their "Monograph of the Palæocrinoidea."

Plants.—The original specimens representing two genera and three species, described by Sir Wm. Dawson in the Report of the Geological Survey of Canada, 1881, and in "Geological History of Plants," 1888.

L. W. Stilwell, Deadwood, S. Dakota:

One specimen each of the following from cretaceous formations, Fox Hills, S. Dakota.

Nautilus De Kayi.

Nautilus ———.

Placentoceras placenta.

Baculites compressus.

BY COLLECTION.

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REPORT OF THE BOTANIST.



REPORT OF THE BOTANIST.

To the Honorable the Regents of the University of the State of New York:

GENTLEMEN.—I have the honor of communicating to you the following report:

Specimens of plants for the State Herbarium have been collected by the Botanist during the past season in the counties of Albany, Broome, Clinton, Columbia, Essex, Franklin, Greene, Kings, Oneida, Rensselaer, Saratoga, Schenectady, St. Lawrence, Suffolk, Ulster and Washington.

Specimens contributed by correspondents were collected in the counties of Essex, Onondaga, Orleans, Queens, Schoharie and Tompkins.

Specimens representing 229 species of plants have been added to the Herbarium during the past year, of which 207 were collected by the Botanist and 21 were contributed. Of the former, 84 are new to the Herbarium; of the latter, 21. The number of species represented in the Herbarium has therefore been increased by 105. Among these are 37 species of fungi considered new to science and hereinafter described as new species. A list of the species of which specimens have been added to the Herbarium is marked A.

23 persons have contributed specimens. Among the contributions are many extra-limital species not included in the foregoing enumeration. A list of the contributors and of their respective contributions is marked B.

A record of species not before reported, together with locality and habitat, and descriptions of such as are deemed new to science, is marked C.

Remarks concerning species previously reported, a record of new localities of rare plants and descriptions of new varieties will be found in a subdivision marked D.

Descriptions of New York species of *Armillaria* and remarks concerning them will be found under E.

The unusually wet character of the season now ended has afforded an excellent opportunity to observe the influence of rainy weather in promoting the growth of fungi. The prevailing temperature has not been high and there has been an almost conspicuous absence of thunder showers, yet rain storms have been frequent and sometimes copious, and cloudy, wet weather has been of long continuance. Under such influences the abundance and destructiveness of the parasitic fungi has been remarkable.

Monilia fructigena, a fungus which attacks apples, pears, peaches and plums, even while hanging on the trees, and breaks out upon their surface in small grayish or yellowish gray tufts, has rarely, if ever, been more abundant and destructive. It is such a pest to peaches that, in regions where they are generally cultivated, it has received the common name of "peach rot." But it is no less dangerous to plums in districts where their cultivation is general, and it might with equal reason be called "plum-rot" in such places. The diseased fruit often remains on the tree during the winter and becomes the source of infection to the next crop. This danger might be greatly lessened if the affected fruit could be gathered and burned or deeply buried in fall or early spring.

A currant-leaf fungus, *Glœosporium ribis*, has also been excessively virulent. In some localities currant leaves have been so severely attacked by it that their vigor was destroyed and they fell to the ground long before the usual time. In my own garden the currant bushes were as destitute of foliage in August as they usually are in November. This fungus does not attack the fruit, but when it is abundant on the foliage, which it covers with brownish or discolored spots, it must necessarily weaken the plants and diminish the succeeding crop of currants.

Glœosporium lagenarium is a fungus generically related to the preceding species. Its attacks upon muskmelons and watermelons have, in some instances, been very severe. It not only causes spots on the fruit, thereby spoiling it, but it has also attacked the foliage, causing spots on it and finally killing it and the vines.

Glœosporium Lindemuthianum is another species which commonly attacks the pods of some varieties of wax beans, producing discolored spots on them and injuring their market value. This year it has been quite aggressive and, in some instances, attacked varieties that were formerly free from it.

Squashes also have suffered unusually from a species of mold, *Rhopalomyces Cucurbitarum*, which invades the blossoms and young fruit and induces rapid decay in the latter.

The downy mildew of the grape, *Peronospora viticola*, has been unusually virulent in its attacks and remarkably luxuriant in its development upon some varieties of the grape. Few species of the cultivated fruits and vegetables of our gardens have wholly escaped the ravages of their respective fungous parasites.

The potato-rot fungus, *Peronospora infestans*, has been active in both garden and field, and has not been at all behind other species in its destructive energy. It was my purpose to make, in my own garden, a thorough trial of the Bordeaux mixture as a preventive of this disease. But the fungus made its appearance so much earlier than usual that the leaves were considerably spotted by it before the first spraying was made and consequently some spores were perfected and scattered before any treatment was given. Notwithstanding this and the tendency of the frequent rains to wash the mixture from the foliage, the plants treated with two applications maintained a green and comparatively healthy foliage much longer than those that were not sprayed. Wishing to see the result of planting diseased tubers, a dozen hills of such were placed on one side of a small experimental plat. By the side of this row three others of equal length were planted with sound tubers. The plants from the diseased tubers grew much more feebly than those from the sound tubers, and the fungus first appeared on the lower leaves of this row. It soon appeared on the adjoining rows but the discolored spots were less in number the more remote the row was from the source of infection. All the spotted leaves were then picked from the vines to see if the progress of the disease might thereby be checked. But it immediately appeared again and then the whole plat was sprayed with the Bordeaux mixture. This gave a very decided check to the progress of the disease. 11 days later, which was July fifteenth, the spraying was repeated. The foliage at this time was in excellent condition, looking green and healthy. An absence of two weeks then intervened. In the meantime heavy rains had fallen and washed much of the mixture from the foliage, and on my return I found the fungus had renewed the attack and made such headway that it was useless to continue the experiment. But enough had been

shown to indicate that if the foliage of the potato plant is kept whitened with the Bordeaux mixture it can be kept free from the fungus.

To try the effect of deep planting on the productive power of the potato, a trench about a foot deep was dug and 12 tubers planted in it about a foot apart. These were covered about four inches deep. At the same time 12 tubers were planted about four inches deep in a row by the side of the trench. As the plants in the trench grew, soil was, from time to time, thrown into the trench till it was filled. In all other respects the two experiment rows received the same treatment. The plants in the trench were more productive than those planted in the ordinary way, yielding 198 tubers weighing $19\frac{1}{2}$ pounds; the others yielding 155 tubers weighing 14 pounds. But the trench system proved superior not only in its greater production, but also in its better protection. Among the tubers dug from the 12 hills in the trench, four were found affected by rot, and these all occurred in two hills. But among those dug from the 12 hills planted in the usual way, 37 affected ones were found, nearly every hill furnishing some. Thus it is evident that deep planting is a protection against rot. The spores produced by the fungus on the leaves are the cause of the mischief in the tuber. They fall to the ground and are washed down through the soil to the tubers by the rain. They do not so easily reach the tubers when they are covered by a thick layer of earth as when they lie near the surface. It also follows that a very compact soil affords greater protection than a loose porous one, though it is not as favorable to production. In a part of the garden the soil was of such a character that the heavy rains had made it very firm and compact. It was scarcely possible to dig the tubers with the implements ordinarily used for this purpose because of the hardness of the soil. Although the vines here had been badly affected and speedily killed by the fungus no rotten tubers were found. The spores, which must have been very plentiful here, were prevented from reaching the tubers by the hard and compact condition of the soil over them. These two examples indicate the way in which the germs of the disease chiefly reach the tubers. Any practical method of preventing them from being washed down through the soil to the tubers will solve the problem of saving them from this infection. But it is far better to strive to pre-

vent the infection of the foliage, for in an early attack, like that of the past season, the foliage might be destroyed before] the tubers were mature. In such a case the crop would be inferior in quantity and quality even if the tubers should remain unaffected. Thorough spraying with the Bordeaux mixture promises to do this if commenced before the fungus makes its appearance and repeated as often as it is washed off by rains.

Thinking that the great windfall in the Adirondack wilderness, where, about 45 years ago, a tornado swept through the forest and prostrated the trees, would be a good locality in which to study the action of wood-destroying fungi and obtain specimens of them, that place was visited. But two agencies had intervened to prevent the realization of my expectations. Forest fires had run through the windfall and consumed all the smaller material and so much time had elapsed since the death of the trees that what the fire had left had passed beyond its period of usefulness as a habitat for wood-loving fungi. Young trees, chiefly poplar, have grown all along in the track of the wind-storm. This wood is now so useful in furnishing material for pulp that the strip of land devastated by the storm is by no means destitute of value.

It was at this time that a peculiar appearance of the oat-fields in St. Lawrence county attracted my attention. The foliage of the plants presented a singular admixture of green, dead-brown and reddish hues, strongly suggestive of that of a "rust-struck" field. But upon examination no rust fungus could be found. Many of the leaves were either wholly or in their upper-half dead and discolored. On these dead parts were a few scattered tufts of a very minute fungus somewhat resembling the common *Cladosporium herbarum*. No other fungus was found upon them and no description has been found corresponding to the characters of this one. It has, therefore, been figured and described in this report as a new species of *Fusicladium*, to which genus it appears to belong. It is not improbable that it inhabits the leaves of some of our northern native grasses and has escaped from them to the oat-fields. It is so minute and so obscure in its character that it has probably been overlooked till now, but having escaped to the oat-fields, and having been stimulated by the favoring character of the season to an unusually abundant development, its existence could no longer be concealed. Its effect on the

foliage is so destructive that it must greatly diminish the yield of this grain in places where it abounds, for no plant can do its best work with half its foliage dead and discolored. It is probable that in an ordinarily dry season its attacks will be much less severe.

Not only have the parasitic fungi manifested great activity, but also the saprophytic, as has been indicated by the abundant and vigorous growth of those species that are found upon stumps, dead branches and prostrate trunks in and about our woodlands. A letter to me from P. H. Dudley, C. E., who is making a study of this subject, with especial reference to its practical and economic aspect, has such a direct bearing upon this subject and records observations of such practical value, that I have, with his permission, appended a copy of it to this report. It is marked F.

Very respectfully submitted.

CHAS. H. PECK.

ALBANY, *December 10, 1889.*

(A.)

PLANTS ADDED TO THE HERBARIUM.

New to the Herbarium.

- Thlaspi arvense L.*
Hesperis matronalis L.
Prunus avium L.
Trapa natans L.
Lacnanthes tinctoria Ell.
Setaria Italica Kunth.
Cynodon dactylon Pers.
Amanita nitida Fr.
Tricholoma sejunctum Sow.
T. grave Pk.
Clitocybe multiceps Pk.
C. catinus Fr.
Clitopilus stilbocephalus B. & Br.
Coprinus Brassicæ Pk.
Cortinarius glutinosus Pk.
C. annulatus Pk.
C. luteus Pk.
C. paludosus Pk.
Lactarius subinsulsus Pk.
L. mutabilis Pk.
Russula brevipes Pk.
R. pectinata Fr.
Marasmius foetidus Fr.
M. albiceps Pk.
Polyporus cæsarius Fr.
P. hispidus Fr.
Poria aurea Pk.
P. latemarginata D. & M.
Hydnum stratosum Berk.
H. pallidum C. & E.
H. acutum Pers.
Irpex rimosus Pk.
Corticium mutatum Pk.
C. Berkeleyi Oke.
C. subaurantiacum Pk.
C. basale Pk.
Peniophora unicolor Pk.
Clavaria similis Pk.
Ditiola conformis Karst.
Mutinus bovinus Morg.
Geaster fimbriatus Fr.
Scleroderma Geaster Fr.
Enteridium Rozeanum Wing.
Oribraria violacea Reiz.
Comatricha longa Pk.
C. subcæspitosa Pk.
- Plasmodiophora Brassicæ Wor.*
Phyllosticta bicolor Pk.
P. Prini Pk.
P. Silenes Pk.
P. Caricis Sacc.
Phoma allantella Pk.
P. Candollei Sacc.
Haplosporella Ailanthi E. & E.
Diplodia Æsculi Lev.
Leptostroma Polygonati Lasch.
Septoria Helianthi E. & K.
S. thecicola B. & Br.
Cytospora orthospora B. & C.
Gloeosporium leptospermum Pk.
Melanconium magnum Berk.
Puccinia obscura Schræt.
P. Eleocharidis Arthur.
P. mammillata Schræt.
P. Malvacearum Mont.
Ustilago Austro-Americana Spag.
Doassansia Alismatis Corn.
Plasmopara Viburni Pk.
Sporotrichum cohærens Schw.
S. cinereum Pk.
Coniosporium Fairmani Sacc.
C. culmigenum Berk.
C. Polytrichi Pk.
Torula convoluta Harz.
Echinobotryum atrum Cd.
Stachybotrys elongata Pk.
Zygodesmus muricatus E. & E.
Dematium parasiticum Pk.
Fusicladium destruens Pk.
Cercospora Apocyni E. & K.
C. granuliformis E. & H.
Sporodesmium antiquum Cd.
Stilbum Spraguei B. & C.
Isaria aranearum Schw.
Tubercularia carpogena Pk.
Fusarium Sclerodermatis Pk.
Epicoccum purpurascens Ehren.
Underwoodia columnaris Pk.
Lachnella cerina Phil.
Tapesia Rosæ Phil.
Helotium mycetophilum Pk.
Cenangium rubiginosum Cke.

Coronophora gregaria Fckl.
Hæmatomyces faginea Pk.
Barya parasitica Fckl.
Hypoxyton effusum Nits.
Eutypa flavovirescens Tul.
Eutypella longirostris Pk.

Anthostoma microsporum Karst.
Didymosporium effusum Schw.
Cryptosporiella hypodermia Sacc.
Leptosphaeria dumetorum Niessl.
Herpotrichia rhodomphalia Sacc.
Lophiotrema auctum Sacc.

Not new to the Herbarium.

Ranunculus bulbosus L.
R. repens L.
Brasenia peltata Pursh.
Capsella Bursa-pastoris Moench.
Cardamine hirsuta L.
Helianthemum Canadense Mx.
Lechea major Mx.
L. thymifolia Pursh.
Linum Virginianum L.
L. usitatissimum L.
Rhus Toxicodendron L.
Trifolium hybridum L.
Desmodium rotundifolium DC.
Lupinus perennis L.
Rubus neglectus Pk.
Rosa Carolina L.
Amelanchier Canadensis T. & G.
Lythrum alatum Pursh.
Carum Carui L.
Cicuta bulbifera L.
Cryptotaenia Canadensis DC.
Levisticum officinale Koch.
Sium cicutæfolium Gmel.
Aster diffusus Ait.
A. multiflorus Ait.
A. cordifolius L.
A. ericoides L.
A. Novi Belgii L.
A. puniceus L.
A. undulatus L.
A. vimineus Lam.
Solidago puberula Nutt.
S. Elliottii T. & G.
S. speciosa Nutt.
S. nemoralis Ait.
Achillea millefolium L.
Artemisia caudata Mx.
Sonchus arvensis L.
Rudbeckia laciniata L.
R. triloba L.
Lobelia Kalmii L.
L. inflata L.
Plantago lanceolata L.
Polygonum dumetorum L.

Celtis occidentalis L.
Physalis viscosa L.
Carya amara Nutt.
Juglans cinerea L.
Asparagus officinalis L.
Potamogeton zosterifolius Shum.
Juncus acuminatus Mx.
J. Canadensis J. Gay.
J. effusus L.
J. filiformis L.
J. scirpoides Lam.
Carex blanda Dew.
C. rosea Schk.
Bromus ciliatus L.
B. racemosus L.
Andropogon macrourus Mx.
Botrychium matricariæfolium A.Br.
Amanita solitaria Bull.
Armillaria mellea Vahl.
A. nardosmia Ellis.
Tricholoma variegatum Scop.
Clitocybe laccata Scop.
Collybia radicata Belh.
C. hariolorum DC.
C. tuberosa Bull.
Mycena corticola Schum.
Omphalia chrysophylla Fr.
O. striipilea Fr.
Pleurotus striatulus Fr.
Clitopilus Noveboracensis Pk.
Inocybe rimosa Bull.
Galera hypnorum Batsch.
Coprinus fimetarius Fr.
C. micaceus Fr.
C. plicatilis Fr.
Hygrophorus ceraceus Fr.
Lactarius fuliginosus Fr.
Russula nigricans Fr.
R. sordida Pk.
R. heterophylla Fr.
R. crustosa Pk.
R. fragilis Fr.
Marasmius erythropus Fr.
Lentinus lepideus Fr.

Lentinus strigosus Schw.	Hydnum repandum L.
L. umbilicatus Pk.	H. aurantiacum A. & S.
Strobilomyces strobilaceus Berk.	H. subfuscum Pk.
Polyporus griseus Pk.	Irpex paradoxus Fr.
P. perennis Fr.	Stereum sanguinolentum Fr.
P. circinatus Fr.	S. rugosum Fr.
P. chioneus Fr.	S. ochraceoflavum Schw.
P. connatus Fr.	S. acerinum Pers.
P. glomeratus Pk.	Hymenochaete tabacina Lev.
P. balsameus Pk.	Clavaria botrytes Pers.
P. versicolor Fr.	Tremella foliacea Pers.
Poria vaporaria Fr.	Exidia glandulosa Fr.
P. mutans Pk.	Lycoperdon constellatum Fr.
P. attenuata Pk.	Scleroderma vulgare Fr.
Dædalea confragosa Pers.	S. Bovista Fr.
Trametes sepium Berk.	Stemonitis Morgani Pk.
Merulius lacrymans Fr.	Siphoptychium Casparyi Rost.
Solenia fasciculata Pers.	Ustilago segetum Dittm.

(B.)

CONTRIBUTORS AND THEIR CONTRIBUTIONS.

Mrs. D. B. Fitch, Norwich, N. Y.

Viola sagittata Ait.	Trillium erectum L.
Floerkea proserpinacoides Willd.	Erythronium albidum Nutt.

L. F. Ward, Washington, D. C.

Hieracium præaltum Vill.

A. G. Grinnan, M. D., Madison Mills, Va.

Calostoma Berkeleyi Massee.

Prof. L. M. Underwood, Syracuse, N. Y.

Clitopilus stilbocephalus B. & Br.	Underwoodia columnaris Pk.
Hydnum stratosum Berk.	Eutypella longirostris Pk.
Peniophora unicolor Pk.	

C. E. Fairman, M. D., Lyndonville, N. Y.

Diplodia Æsculi Lev.	Eutypa flavovirescens Tul.
Zygodesmus muricatus E. & E.	Diatrype albopruinata Schw.
Tapesia Rosæ Phil.	Leptosphaeria dumetorum Niessl.
Haplosporella Ailanthi E. & E.	Coniosporium Fairmani Sacc.
Lophiotrema auctum Sacc.	C. culmigenum Berk.
Puccinia Malvacearum Mont.	Æcidium Lysimachiae Wallr.

F. E. Emery, Geneva, N. Y.

Puccinia Malvacearum Mont.

Prof. J. A. Lintner, Albany, N. Y.

Uncinula macrospora Pk.	Fuligo varians Sommerf.
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W. A. Setchell, Cambridge, Mass.

Doassansia Alismatis Corn.	Tolysporium bullatum Schraet.
D. Sagittariæ Schraet.	Entyloma Compositarum Farl.
D. occulta Corn.	

Prof. J. C. Smock, Albany, N. Y.

Placodium elegans Lk. | *Theloschistes concolor* Dicks.

J. Dearness, London, Canada.

Teucrium botrytis L. | *Libertella acerina* West.
Botrytis geniculata Cd. | L. *faginea* Desm.

W. T. Swingle, Manhattan, Kansas.

Ustilago provincialis K. & S.

Prof. B. D. Halsted, New Brunswick, N. J.

Synchytrium Vaccinii Thom. | *Peronospora Cubensis* B. & C.

Harold Wingate, Philadelphia, Pa.

Orcadella operculata Wing. | *Comatricha longa* Pk.

Geo. A. Rex, M.D., Philadelphia, Pa.

Siphoptychium Casparyi Rost. | *Comatricha longa* Pk.
Physarum lividum Rost. | *Cribraria violacea* Rex.
Stemonitis dictyospora Rost.

Prof. H. J. Weber, Lincoln, Neb.

Puccinia vexans Farl.

Wm. Herbst, M. D., Trexlertown, Pa.

Pholiota æruginosa Pk. | *Polyporus lucidus* Leys.
Clitocybe multiceps Pk.

Rev. J. L. Zabriskie, Flatbush, N. Y.

Puccinia mammillata Schræt. | *Echinobotryum atrum* Cd.
Ustilago Austro-Americana Speg. | *Hypoxyton effusum* Nits.
Sporodesmium antiquum Cd. | *Comatricha longa* Pk.

P. H. Dudley, New York, N. Y.

Merulius lacrymans Fr. | *Polyporus hispidus* Fr.
Polyporus lucidus Leys.

S. M. Tracy, Agricultural College, Miss.

<i>Phragmidium Fragariastris</i> Schræt.	<i>Uromyces Trifolii</i> DC.
P. subcorticium Wint.	U. <i>Ænotheræ</i> Burr.
<i>Puccinia caulicola</i> T. & G.	U. <i>Lespedezæ</i> Pk.
P. <i>Sporoboli</i> Arth.	U. <i>Hyperici</i> Curt.
P. <i>Galiorum</i> Lk.	U. <i>appendiculatus</i> Lev.
P. <i>Hieracii</i> Mart.	U. <i>Euphorbiæ</i> C. & P.
P. <i>Andropogonis</i> Schw.	<i>Ustilago sphærogena</i> Burr.
P. <i>Helianthi</i> Schw.	<i>Uredo Artemisiæ</i> Rab.
P. <i>Silphii</i> Schw.	<i>Coleosporium Rubi</i> E. & M.
P. <i>Malvastris</i> Pk.	<i>Melampsora salicina</i> Lev.
P. <i>lateripes</i> B. & R.	<i>Ræstelia aurantiaca</i> Pk.
P. <i>heterospora</i> B. & C.	<i>Æcidium Clematidis</i> DC.
P. <i>Violæ</i> DC.	Æ. <i>Psoraleæ</i> Pk.
<i>Uromyces Spermacoces</i> Wint.	Æ. <i>Sii</i> Fekl.
U. <i>Sparganii</i> C. & P.	<i>Peridermium orientale</i> Cke.
U. <i>Terebinthi</i> Wint.	<i>Synchytrium fulgens</i> Schræt.

Cystopus cubicus Lev.
Peronospora Halstedii Farl.
Microstroma leucosporum Mont.
Cylindrosporium Heraclei E. & E.
Cercospora Diospyri Thum.
C. *sordida* Sacc.
C. *clavata* Ger.
C. *Heliotropii* E. & E.
Cerebella Andropogonis Ces.

Piggotia Fraxini B. & C.
Sphæropsis Menispermii Pk.
Sphaerotheca Castagnei Lev.
Uncinula macrospora Pk.
Erysiphe graminis DC.
Capnodium puccinioides E. & E.
Phleospora Ulmi Wallr.
Phyllachora Ulmi Fekl.
Hypocrea Hypoxylon Schw.

F. W. Anderson, Great Falls, Mont.

Phragmidium Potentillæ Wint.
P. *subcorticium* Wint.
Puccinia Saxifragæ Schlect.
P. *Asteris* Duby.
P. *Tanacetii* DC.
P. *Malvastri* Pk.
P. *Troximontis* Pk.
P. *intermixta* Pk.
P. *variolaris* Hark.
P. *Polygoni-amphibii* Pers.
P. *hysteriiformis* Pk.
P. *Menthæ* Pers.
P. *Caricis* Reb.
P. *Giliæ* Hark.
P. *Rubigo-vera* DC.
P. *Phragmitis* Schum.
P. *graminis* Pers.
Uromyces Eriogoni E. & H.
U. *Junci* Schw.
U. *Trifolii* DC.
U. *Spragueæ* Hark.
Ustilago Caricis Fekl.
U. *Montaniensis* E. & H.
Melampsora Lini Tul.
M. *populina* Lev.
M. *salicina* Lev.
Uredo Oxytropidis Pk.
Coleosporium Sonchi-arvensis Lev.

Cronartium Asclepiadeum Kze.
Æcidium gaurinum Pk.
Æ. *monoicum* Pk.
Æ. *Clematidis* DC.
Æ. *Chrysopsidis* E. & A.
Æ. *Ligustici* E. & E.
Æ. *Asteratum* Schw.
Sporodesmium tabacinum E. & E.
Coniothyrium concentricum Desm.
Cladosporium Typharum Desm.
Helminthosporium subcuticulare E. & E.
Ramularia lactea Sacc.
Didymaria Clematidis C. & H.
Cystopus Bliti Biv.
C. *candidus* Lev.
C. *cubicus* Str.
Phyllactinia suffulta Reb.
Sphaerotheca Castagnei Lev.
Uncinula adunca Lev.
Erysiphe graminis DC.
E. *sepulta* E. & E.
E. *communis* Wallr.
E. *Cichoracearum* DC.
Nectria Ribis Rab.
Rhytisma salicinum Fr.
Leptosphaeria Typhæ Karst.

Prof. W. R. Dudley, Ithaca, N. Y.

Acer sacch. var. *nigrum* Gr. | *Ulmus racemosa* Thamas.

E. J. Forster, M. D., Boston, Mass.

Lepiota farinosa Pk.

Mrs. P. H. Dudley, New York, N. Y.

Fruit of passion flower, *Passiflora edulis*. An alga from the hot springs of Arkansas. Collected by Mrs. L. E. Holden.

(C.)

PLANTS NOT BEFORE REPORTED.

Hesperis matronalis, L.

Roadside, near Feurabush, Albany county. May. This plant is sometimes cultivated for ornament and escapes from cultivation and becomes naturalized in some places. Buffalo. *David F. Day.*

Prunus avium, L.

Ravines and hillsides. Near Catskill. May. Also reported by Professor Dudley as frequent about Ithaca, and especially abundant on both shores of Cayuga lake. An introduced plant which has escaped from cultivation.

Trapa natans, L.

This curious aquatic has been introduced, but is well established in Sander's lake, near Schenectady.

Aster vimineus, Lam.

This species is not rare in moist, sandy soil in the eastern part of Long Island. It is variable in aspect, the branches being either horizontal or somewhat ascending, and having the flowers either crowded or racemous.

Lacnanthes tinctoria, Ell.

Near Manor, Suffolk county. August. This plant is named in the list of those mentioned by Dr. Torrey in the Flora of New York, Vol. II, p. 522, as likely to occur on Long Island. Its occurrence in this place has verified his prediction.

Cynodon dactylon, Pers.

Vacant lots in Long Island city. September. This is considered a valuable grass in some of the southern States, but it is very persistent and eradicated with some difficulty. As it prefers a warmer climate it will probably not prove troublesome on Long Island.

Amanita nitida, Fr.

Menands, Albany county. Our plant is more slender than the typical form and has smaller, but more numerous, warts, but in other respects it exhibits the characters of this species.

Tricholoma sejunctum, Sow.

Mixed woods. Manor and Quogue. September. This species is not uncommon in sandy soil on Long Island, though in Europe it

occurs chiefly in gravelly soil. With us it varies considerably in the color of the pileus, which may be either white or pale yellow, tinged with green or brown. It is often irregular or deformed and frequently destitute of an umbo. The fibrils are either brown or blackish. The bitter taste is sometimes absent.

Tricholoma grave, n. sp.

[Plate 1. Figs. 5 to 8.]

Pileus at first hemispherical, then broadly convex, compact, glabrous, grayish-tawny and somewhat spotted when moist, paler when dry, the margin paler, involute, often irregular, clothed with a minute appressed grayish-white tomentum or silkiness, flesh grayish-white; lamellæ subdistant, rounded behind or sinuate, adnexed, at first whitish, then pale ochraceous-tawny; stem stout, compact, solid, subsquamulose or furfuraceous, abruptly attenuated at the base, penetrating the soil deeply, grayish-white; spores broadly elliptical, .0003 in. long, .0002 broad.

Pileus 5 to 8 in. broad; stem 3 to 4 in. long, 1 to 1.5 in. thick.

Mixed woods of pine and oak. Manor. September.

This species is remarkable for its great size and weight. It is apparently allied to *Tricholoma colossus*, from which it is separated by the absence of any viscosity of the pileus, the radicating character of the base of the stem and by the flesh not assuming a reddish color. By its moist pileus it appears to belong to the Spongiosi rather than to the Limacini among which *T. colossus* is placed.

Clitocybe multiceps, n. sp.

Pileus fleshy, thin except on the disk, firm, convex, slightly moist in wet weather, whitish, grayish or yellowish-gray, flesh white, taste mild; lamellæ close, adnate or slightly decurrent, whitish; stems densely caespitose, equal or slightly thickened at the base, solid or stuffed, firm, elastic, slightly pruinose at the apex, whitish; spores globose, .0002 to .0003 in. broad.

Pileus 1 to 3 in. broad; stem, 2 to 4 in. long, 3 to 6 lines thick.

Open places, grassy ground, etc. Albany and Sandlake. June and October. This species forms dense tufts often composed of many individuals. In this respect it is related to such species as *Clitocybe tumulosa*, *C. aggregata* and *C. illudens*. From the crowding together of many individuals the pileus is often irregular. Sometimes the disk is brownish and occasionally slightly silky. The lamellæ are sometimes slightly sinuate, thus indicating a relationship to the

species of *Tricholoma*. The taste, though mild, is somewhat oily and unpleasant. The plants appear in wet, rainy weather, either early in the season or in autumn. Specimens have been sent to me from Massachusetts by R. K. Macadam and Professor Farlow, and from Pennsylvania by Dr. W. Herbst.

Clitocybe catinus, Fr.

Ray Brook, Adirondack mountains. August. The pileus is at first white, but in wet weather it becomes pallid or discolored with age. The plants were found growing among pieces of bark of arbor vitae lying on the ground.

Clitopilus stilbocephalus, B. & Br.

Syracuse. October. Prof. L. M. Underwood. The specimens apparently belong to the variety represented in Cooke's Illustrations, plate 599.

Coprinus Brassicæ, n. sp.

[Plate 2. Figs. 9 to 14.]

Pileus membranous, at first ovate or conical, then broadly convex, squamulose, finely striate to the disk, white becoming grayish-brown, the margin generally splitting and becoming recurved; lamellæ narrow, crowded, reaching the stem, brown with a slight ferruginous tint; stem slender, glabrous, hollow, slightly thickened at the base, white; spores elliptical, brown, .0003 in. long, .0002 broad.

Pileus 4 to 5 lines broad; stem 8 to 10 lines long.

Decaying stems of cabbage, *Brassica oleracea*. Menands. August.

The species is easily known by its squamulose pileus and its brown lamellæ and spores. It is related by these to such species as *C. phæosporus*, *C. Friesii* and *C. tigrinellus*.

Cortinarius (Phlegmacium) glutinosus, n. sp.

Pileus convex, glutinous, brownish-ochraceous, the margin narrowly involute, flesh yellowish; lamellæ adnexed, olivaceous; stem solid, thickened at the base, scarcely bulbous, whitish or pallid; spores subglobose or broadly elliptical, .0003 in. long, .00025 to .0003 broad.

Pileus 1 to 3 in. broad; stem 1.5 to 3 in. long, 3 to 5 lines thick.

Mossy ground under hobble bushes, *Viburnum lantanoides*. Sevey. Adirondack mountains. July.

The dull ochraceous pileus, olivaceous lamellæ and pallid stem are the prominent features of the species. The margin of the pileus is sometimes rimose. In drying the color changes to a chestnut hue.

Cortinarius (Inoloma) annulatus, n. sp.

[Plate 2. Figs. 1 to 4.]

Pileus broadly convex, dry, villose-squamulose, yellow, flesh yellowish; lamellæ rather broad, subdistant, adnexed, yellow; stem solid, bulbous, somewhat peronate by the yellow fibrillose annular-terminated veil; spores broadly elliptical or subglobose, .0003 in. long.

Pileus 1 to 3 in. long; stem 1.5 to 3 in. long, 3 to 6 lines thick.

Thin woods. Whitehall. August.

The whole plant is yellow inclining to ochraceous. It has the odor of radishes. The squamules of the pileus are pointed and erect on the disk, and often darker colored there. The species is allied to *C. topiaceus* and *C. callisteus*, from which it is separated by its persistently annulate stem and more yellow color.

Cortinarius (Dermocybe) luteus, n. sp.

Pileus conical or convex, unpolished, yellow, often darker on the disk, flesh yellow; lamellæ adnexed, yellow; stem equal, long, solid, silky fibrillose, yellow; spores subglobose or broadly elliptical, .0003 in. long, nearly as broad.

Pileus 1 to 2 in. broad; stem 2 to 4 in. long, 6 lines thick.

Mossy ground in woods. Sevey. July.

Closely related to *C. cinnamomeus*, but differing in its stouter stem and nearly uniform yellow color.

Cortinarius (Telamonia) paludosus, n. sp.

Pileus conical or convex, ferruginous when moist, buff-yellow or pale ochraceous when dry, flesh yellowish; lamellæ broad, subdistant, adnate, saffron-yellow; stem long, equal, flexuous, solid, peronate and subannulate by the fibrillose yellow veil; spores .0003 to .00035 in. long, .0002 broad.

Pileus 1 to 1.5 in. broad; stem 2 to 3 in. long, about 2 lines thick.

Mossy ground in swamps. Rainbow, Franklin county. August.

Lactarius subinsulsus, n. sp.

Pileus firm, convex or nearly plane, umbilicate, viscid, azonate, glabrous, whitish or pallid, the margin at first slightly tomentose, soon naked, milk white, tardily acrid; lamellæ narrow, crowded, adnate or decurrent, whitish; stem short, hollow, whitish, not spotted; spores subglobose, .0003 to .00035 in. long, .0003 broad.

Pileus 2 to 4 in. broad; stem 1 to 1.5 in. long, 6 to 8 lines thick.

Pine groves. Rainbow. August.

The species is allied to *L. insulsus*, from which it is distinct by its zoneless pileus, tomentose young margin and tardily acrid taste. The stem is without spots and obscurely rugulose-reticulated, as in some species of *Russula*. The tomentose young margin puts the species among the *Tricholomoidei* near *L. pubescens*.

***Lactarius mutabilis*, n. sp.**

[Plate 1. Figs. 1 to 4.]

Pileus thin, convex or nearly plane, zonate when moist, reddish-brown, the disk and zones darker, zoneless when dry, flesh colored like the pileus, milk sparse, white, taste mild; lamellæ narrow, close, adnate, whitish, with a yellowish or cream-colored tint when old; stem equal or tapering upward, stuffed or spongy within, glabrous, colored like the pileus; spores subglobose, rough, .0003 in. broad.

Pileus 2 to 4 in. broad; stem 1 to 2 in. long, 3 to 5 lines thick.

Low, damp places. Selkirk and Yaphank. June and September.

The species is allied to *L. subdulcis*, from which the larger size and zonate pileus separate it. The zones disappear in the dry plant, and this change in the marking of the pileus suggests the specific name. They appear to be formed by concentric series of more or less confluent spots and are suggestive of such species as *L. deliciosus* and *L. subpurpureus*.

***Russula brevipes*, n. sp.**

[Plate 2. Figs. 5 to 8.]

Pileus at first convex and umbilicate, then infundibuliform, dry, glabrous or slightly villose on the margin, white, sometimes varied with reddish-brown stains, flesh whitish, taste mild, slowly becoming slightly acrid; lamellæ thin, close, adnate or slightly rounded behind, white; stem very short, solid, white; spores globose, verruculose, .0004 to .0005 in. in diameter.

Pileus 3 to 5 in. broad; stem 6 to 10 lines long, 6 to 10 lines thick.

Sandy soil in pine woods. Quogue. September.

This species is related to *Russula delica*, but is easily distinguished by its short stem and crowded lamellæ. The pileus also is not shining and the taste is tardily somewhat acrid. From *Lactarius exsuccus* it is separated by the character of the lamellæ and the very short stem which is about as broad as it is long. The spores also are larger than in that species. The lamellæ in the young plant are sometimes studded with drops of water. They are not clearly decurrent. Some of them are forked at the base. The pileus is but slightly raised above the surface of the ground and is generally soiled by adhering dirt and often marked by rusty or fuscous stains. The plants grew in old roads in the woods where the soil had been trodden and compacted.

Russula pectinata, Fr.

Grassy or mossy ground in thin woods or groves. Menands and Cemetery, Albany county. July.

Marasmius foetidus, Fr.

On fallen twigs, leaves, etc. Manor. September. In our plant the pileus is rufescent. The stem also is rufescent above, brown below. The species is easily known by its strong odor.

Marasmius albiceps, n. sp.

[Plate 2. Figs. 15 to 18.]

Pileus membranous, either convex or campanulate, glabrous, white; lamellæ broad, distant, adnate or arcuate-decurrent, white; stem corneous, setiform, glabrous, black, paler at the apex, attached to the matrix by radiating brown hairs or fibres; spores obovate or subelliptical, .00025 to .0003 in. long, about half as broad, usually containing a shining nucleus.

Pileus about 2 lines broad; stem 8 to 15 lines long.

Among fallen leaves in mixed woods. Manor. September. In shape the pileus often approaches that of *Omphalia fibula*. In the larger specimens the lamellæ are strongly decurrent as in that species.

Polyporus cæsarius, Fr.

The specimens which I have referred to this species have a striking resemblance to faded specimens of *Polyporus sulphureus*, but in addition to the paler pileus the pores are white and more unequal. The spores, also, are smaller than those of *P. sulphureus*, though I can not tell if they agree with the spores of the European *P. cæsarius*, for I have been able to find no description which gives their dimensions. Our specimens were found at the base of an oak stump, near Manor. September.

Polyporus hispidus, Fr.

Oak trunk. Quogue. September. But a single, rather old specimen was found. It is evidently a rare species with us, though said to be more plentiful farther south.

Poria late-marginata, D. & M.

Prostrate trunk of wild red cherry, *Prunus Pennsylvanica*. South Ballston.

Poria aurea, n. sp.

Effused, forming patches several inches in extent, 2 to 3 lines thick, separable from the matrix, golden yellow; subiculum thin, sub-gelatin-

ous, the young margin byssoid or fimbriate, greenish-yellow, soon disappearing; pores small, subrotund, elongated, the dissepiments thin, rather soft; spores minute, subelliptical, .00016 to .0002 in. long, .00008 to .00012 broad.

Decaying wood of maple, *Acer saccharinum*. Sevey. July.

Apparently closely related to *Poria xantha*, but separable from the matrix and remarkable for its somewhat gelatinous subiculum. It is an attractive species.

Hydnum stratosum, Berk.

Lower side of an old log. Syracuse. Underwood.

This is a very singular species. The subiculum appears as if formed of a coarse brown tow-like tomentum, while the aculei appear in two or three strata one above another. They are connected at the base by slender branches or processes similar to themselves in color and texture.

Hydnum pallidum, C. & E.

Dead branches of oak, *Quercus alba*. Manor. September. At first small suborbicular patches appear with distant aculei, but with age these patches become confluent and the aculei longer and more numerous. The subiculum, when dry, becomes rimose as in species of *Corticium*. The spores in our specimens are minute, elliptical, .0002 in. long, .0001 to .00012 broad.

Hydnum acutum, Pers.

Decaying wood of deciduous trees. Sevey. July.

The species of Persoon has been regarded as having doubtful value by some European authors. Our plant agrees tolerably well with his description: It forms irregular, scarcely noticeable spots, one or two inches broad. The subiculum is scarcely more than a slight meakiness or prinosity, with a somewhat indefinite margin. It is subcinereous when moist, whitish or pallid when dry. The aculei are very distant, acute or setiform, rather rigid but scarcely visible to the naked eye. The spores are subglobose, slightly angular, .00016 to .0002 in. in diameter.

Irpex rimosus, n. sp.

Resupinate, at first suborbicular, then confluent, forming irregular patches, thin, whitish or pallid, becoming rimose-areolate, the margin more or less free or slightly reflexed; hymenium, at first subporous or dædaloid, the dissepiments soon prolonged into aculei which are either subulate compressed or incised, and at length fasciculate from the cracking of the subiculum.

Bark of birch, *Betula lutea*. Catskill mountains. September.

Corticium mutatum, n. sp.

Effused, forming irregular extended patches; hymenium tumid when moist, centrally tuberculose, with more or less evident radiating folds toward the margin, much thinner when dry, nearly even, rimose, dingy yellowish inclining to cream color or slightly tinged with flesh color, the margin byssoid or subfimbriate, white; spores oblong, colorless, straight or slightly curved, .0006 to .0007 in. long, .00016 to .0002 broad.

Dead bark of poplar *Populus tremuloides*. Sevey. July.

The species is related to *Corticium læve*, but differs in its color and in the character of its spores. It is remarkable for the difference between the fresh moist specimens and the dry ones. In the former the hymenium is so uneven that it is suggestive of *Phlebia*, but in the latter the folds and tubercles have disappeared and the hymenium has become rimose, revealing the white subiculum in the chinks. This change is suggestive of the specific name.

Corticium Berkeleyi, Cke.

Decaying wood of willow, *Salix alba*. Copake. June.

The specimens have been identified by comparison only, as I have seen no description of this species. They are to this extent doubtful.

Corticium subaurantiacum, n. sp.

Effused, soft, thin, the tomentose subiculum and margin bright orange; hymenium even, grayish-yellow or orange tinted, having a pruinose appearance, sometimes slightly rimose when dry; spores subelliptical, .0003 in. long, .0002 broad.

Dead bark of spruce, *Picea nigra*. Rainbow. August.

It bears some resemblance to *Merulius subaurantiacus*, but there are no folds in the hymenium.

Corticium basale, n. sp.

Effused, closely adnate, tough, at first whitish, the hymenium becoming brown with a waxy appearance, the broad margin dingy-white.

Base of living trees. Whitehall. August.

It follows the inequalities of the bark from which it is inseparable. It is remarkable for its waxy appearance, but very tenacious substance. It was found on the bases of ash, *Fraxinus Americana* and basswood, *Tilia Americana*. The specimens were sterile.

Peniophora unicolor, n. sp.

Effused, thin, membranous, soft, subseparable, even, subpulverulent, pale ochraceous, the margin and subiculum concolorous with or a

little paler than the hymenium, sometimes extending in branching string-like fibers; metuloids sparse, subcylindrical, obtuse, rough, .0016 in. long, .0003 broad.

Decaying wood. Syracuse. September. *Underwood*.

The specimens are imperfect, being destitute of spores, but the species is apparently quite distinct by the characters given.

***Clavaria similis*, n. sp.**

Cæspitose, subtenacious, slender, three to four times dichotomously branched, pallid, the ultimate ramuli short, obtuse, the axils rounded; spores subglobose, .00025 in. in diameter, mycelium white.

Plant 1 to 2 in. high. Woods. Plattsburgh. August.

This scarcely differs from *Clavaria muscoides*, except in its paler color and in the obtuse tips of the ultimate ramuli.

***Ditiola conformis*, Karst.**

Decaying wood of birch, *Betula lutea*. Catskill mountains. September.

***Mutinus bovinus*, Morg.**

Sandy soil. Manor. September. The spores are the same as in *Mutinus Ravenelii*, to which this plant appears to be too closely related.

***Geaster fimbriatus*, Fr.**

Ground in woods. Whitehall. August.

This is the twelfth species of *Geaster* that has been found in our State. Most of the species are quite rare and some have been found but once.

***Scleroderma Geaster*, Fr.**

Sandy soil. Manor. September.

***Enteridium Rozeanum*, Wing.**

Decaying wood. North Greenbush. This is *Reticularia*? *Rozeana* Rost. It resembles *Reticularia Lycoperdon* externally and has sometimes been confused with it.

***Cribraria violacea*, Rex.**

Bark of balsam fir. Adirondack mountains. G. A. Rex.

***Comatricha longa*, n. sp.**

[Plate 3. Figs. 1 to 5.]

Stems growing from a shining membranous hypothallus, closely gregarious, penetrating the peridia as a columella, capillary, black;

peridia narrowly cylindrical, generally elongated, six to twenty lines long, often flexuous, very fugacious, grayish-black; capillitium rising from the columella, its branches generally somewhat reticulately connected near their base and forming a few large meshes, externally divided into slender, sharp-pointed, divergent, spine-like branchlets, with free apices, blackish; spores globose, even, .0003 to .00035 in. in diameter.

Bark of willow, *Salix Babylonica*. Flatbush. September. Rev. J. L. Zabriskie.

In the color of the spores and capillitium as seen in mass this plant resembles *Stemonitis fusca*. In size also it equals or exceeds that species. But in the character of the capillitium it is quite peculiar. Sometimes its branches, which grow in an alternate manner from the sides of the columella, are two or three times forked and entirely free, but usually they are somewhat connected with each other near the columella, but have their ultimate ramuli wholly free. By this character it differs considerably from other species of the genus, but scarcely enough, it seems to me, to warrant its generic separation. The columella generally passes through the capillitium nearly or quite to its apex, but sometimes in very long specimens it is lost above in the few large meshes. Fine specimens of this remarkable species have been sent me from Philadelphia, Pa., where it is not rare, by Messrs. Stevenson, Rex and Wingate. Specimens from the last gentleman are quite two inches long.

Comatricha subcæspitosa, n. sp.

[Plate 3, Figs. 6 to 9.]

Stems subcæspitose or loosely clustered, thickened at the base, black, about half the length of the sporangia, extending through the capillitium as a columella; peridia ovate-oblong, obtuse, fugacious; capillitium growing from the columella, reticulately connected and also forming a superficial net with coarse meshes, blackish; spores globose, even, blackish-brown, .0004 to .00045 in. in diameter.

Decorticated wood of hemlock, *Tsuga Canadensis*. Sandlake. July.

This species resembles *Stemonitis fusca* in color. In size it approaches *Comatricha typhina*. Its capillitium is variously connected, and appears to combine the reticulation of *Comatricha* and *Stemonitis*, but on account of the net work not being wholly parallel to the walls of the peridium it is placed in *Comatricha*. The plants are mostly collected in small groups or loose clusters of two to ten individuals. Its coarser meshes and larger spores distinguish it from *C. typhina*.

Plasmodiophora Brassicæ, Wor.

Roots of cabbage, *Brassica oleracea*. Menands. October.

This fungus causes swellings or excrescences in the roots of the host plant. These swellings have received the common name "club-root." Cabbages attacked by this disease fail to perfect their heads. The affected roots should be taken from the ground and burned in order to destroy the fungous spores they contain. It has been recommended that the ground should not again be planted with cabbages or other plants of the Mustard family until after the lapse of two or three years, in order that the germs of this disease, which may be in the soil, may have time to perish. In the meantime other crops may occupy the land.

Phyllosticta bicolor, n. sp.

Spots rather large, two to six lines broad, irregular, at first brown, then centrally whitish, with a broad brown margin, brown beneath; perithecia epiphyllous, occupying the whitish or central part of the spots, minute, .004 to .005 in. broad, black; spores minute, oblong, colorless, .0002 to .00025 in. long, .00008 to .0001 broad.

Living leaves of thimbleberry, *Rubus odoratus*. Whitehall. August.

Phyllosticta Prini, n. sp.

Spots small, suborbicular, white or grayish above, brownish beneath; perithecia small, .007 in. broad, epiphyllous, depressed, black; spores elliptical or oblong, .0003 to .0005 in. long, .00016 broad.

Living leaves of winterberry, *Ilex verticillata*. Catskill mountains. September.

Phyllosticta Silenes, n. sp.

Spots large, sometimes occupying half the leaf, pallid; perithecia amphigenous or hypophyllous, minute, punctiform, black; .004 to .005 in. broad; spores oblong or cylindrical, colorless; .0004 to .0005 in. long, .00015 to .0002 broad.

Living leaves of sleepy catchfly, *Silene antirrhina*. Copake Iron Works. June.

Phyllosticta Caricis, Sacc.

Living leaves of Pennsylvanian sedge, *Carex Pennsylvanica*. Catskill mountains. September.

Phoma allantella, n. sp.

Perithecia subglobose, subsuperficial, .007 to .008 in. broad, black; spores minute, allantoid, .00016 to .0002 in. long, about half as broad.

Whitened decorticated wood of oak, *Quercus rubra*. Catskill mountains. September.

Phoma Candollei, Sacc.

Leaves of box, *Buxus sempervirens*. Patchogue. August.

Haplosporella Ailanthi, E. & E.

Dead bark of *Ailanthus glandulosus*. Lyndonville. May. C. E. Fairman.

Diplodia Æsculi, Lev.

Dead bark of horse chestnut, *Æsculus Hippocastanum*. Lyndonville. Fairman.

Leptostroma Polygonati, Lasch.

Dead stems of giant Solomon's seal, *Polygonatum giganteum*. Menands. May.

Didymosporium effusum, Schw.

Dead bark of slippery elm, *Ulmus fulva*. Copake Iron Works. June.
Our plant differs somewhat from the type, and may be designated as

Var. *distinctum*. Heaps rotund, erumpent, distinct; spores oblong, oblong-ovate or elliptical, uniseptate, rarely biseptate, colored, .0014 to .0018 in. long, .0006 to .0008 broad, oozing out and staining the matrix.

Septoria Helianthi, E & K.

Living leaves of sunflower, *Helianthus annuus*. Rainbow. August.
Our plant is a variety in which the perithecia are amphigenous and the spots by confluence are very large and irregular.

Septoria thecicola, B. & Br.

Capsules and pedicels of moss, *Polytrichum juniperinum*. Sevey. July.

Cytospora orthospora, B. & C.

Dead branches of clammy locust, *Robinia viscosa*. Sandlake. June.

Melanconium magnum, Berk.

Dead bark of sugar maple, *Acer saccharinum*. Stark, St. Lawrence county. July.

Puccinia Eleocharidis, Arthur.

Living stems of *Eleocharis palustris*. Shore of Lake Champlain near Plattsburgh. August.

Puccinia mammillata, Schrœt.

Living leaves of hedge bindweed, *Polygonum dumetorum*. Flatbush. October. Zabriskie.

Puccinia Malvacearum, Mont.

Living leaves of hollyhock, *Malva sylvestris*. Geneva. May. F. E. Emery. Lyndonville, C. E. Fairman. This fungus causes a disease in hollyhocks that has sometimes been so severe in Europe as to prevent the cultivation of these flowers.

Puccinia obscura, Schr et.

Living leaves and stems of field rush, *Luzula campestris*. Menands. May.

Our specimens do not fully agree with the description of the European fungus, but the agreement morphologically is so close that it does not seem advisable at present to separate our plant specifically. According to Plowright, "the teleutospores are not formed until August or September," but in our specimens they occur in May, and are intermingled with the uredospores, occurring in the same sorus with them. Mesospores were not seen. The name *Puccinia obscura* var. *vernalis* is proposed for this fungus, as it will indicate the principal character wherein it differs from the European plant. The teleutospores are not more highly colored than the uredospores, though this may be due to their young condition.

Ustilago Austro-Americana, Speg.

Living leaves and spikes of Pennsylvanian knotweed, *Polygonum Pennsylvanicum*. Flatbush. September. Zabriskie.

"The spores ooze out in tendrils sometimes six lines long." This is the fourth species of smut that has been found on species of *Polygonum* in our State.

Doassansia Alismatis, Cornu.

Living leaves of water plantain, *Alisma Plantago* var. *Americana*. Sharon Springs. July. W. A. Setchell.

Plasmopara Viburni, n. sp.

Spots irregular, somewhat indefinite, more or less confluent along the principal veins of the leaves, brown or reddish-brown; hyph e hypophyllous, sparse, inconspicuous, bearing two to four short, nearly horizontal and mostly alternate branches near the top, the ultimate ramuli terminating in two or three sterigmata or subulate points; conidia terminal on the branches, subglobose, ovate or broadly elliptical, nearly colorless, generally .0006 to .0008 in. long, .0005 to .0006 broad, occasionally .0012 to .0016 in. long.

Living leaves of arrow wood, *Viburnum dentatum*. Baiting Hollow Station, Long Island. September.

This fungus is very closely allied to *Plasmopara viticola*, B. & De T. *Peronospora viticola* of most authors, of which it may prove to be only a variety. It is much smaller than that plant and does not form dense downy tufts or patches, but is so scattered and sparse in its mode of growth as to be not easily visible to the naked eye. Conidia of monstrous size are not rare, but oöspores were not seen. Its habit of following the veins of the leaf is peculiar.

Sporotrichum cohærens, Schw.

On an old wooden pail in a cellar. Menands. September.

Sporotrichum cinereum, n. sp.

Patches oblong, effused, pulverulent, cinereous; hyphæ very slender, .00015 in. broad, branched, crispate-flexuous, denticulate; spores abundant, globose, .00012 to .00016 in. in diameter.

Wood of apple tree. Manor. September.

Coniosporium Fairmani, Sacc.

Dried shell of Hubbard squash. Lyndonville. Fairman.

Coniosporium culmigenum, Berk.

Dead stems of motherwort, *Leonurus cardiaca*. Lyndonville. Fairman.

The spores in these specimens are smaller than in the type. The specimens are labeled var. *minor*.

Coniosporium Polytrichi, n. sp.

Heaps of spores minute, .003 to .004 in. broad, closely gregarious, superficial, black; spores globose, granulose, black, .00065 to .0008 in. in diameter.

Capsules of moss, *Polytrichum juniperinum*. Sevey. July.

Torula convoluta, Harz.

Decaying tubers of potato, *Solanum tuberosum*. Menands. April.

Echinobotryum atrum, Cd.

Decaying tubers of potato. Menands. April. Flatbush. Zabriskie.

Stachybotrys elongata, n. sp.

[Plate 3. Figs: 10 to 13.]

Hyphæ elongated, intricately branched, sparingly septate, minutely roughened, forming brown tomentose cushion-shaped tufts one to three lines in diameter, the fertile branches terminated by a capitate cluster of spores borne upon more or less elongated sporophores,

which are mostly thickened or bulbous at the base; spores globose, colored, .00025 to .0003 in. in diameter.

Dead branches of maple, *Acer rubrum*. Manor. September.

The pulvinate tufts resemble those of *Streptothrix atra*, but are paler in color.

Zygodesmus muricatus, E. & E.

Decaying wood. Lyndonville. May. Fairman.

Dematium parasiticum, n. sp.

[Plate 3. Figs. 14 to 18.]

Fertile hyphæ erect, simple or slightly branched, septate, colored, bearing catenulate spores at their tips and on their sides; spores subelliptical or limoniform, mostly pointed at one or both ends, colored, .0004 to .0005 in. long, .0002 to .00025 in. broad.

Parasitic on some Hydnum, apparently *H. carbonarium*. Rainbow. August.

The parasite gives a smoky-black hue to the Hydnum.

Fusicladium destruens, n. sp.

[Plate 3. Figs. 19 to 22.]

Hyphæ rather short, .0008 to .002 in. long, fasciculate, continuous or with one or two septa near the base, colored, forming small olive-green tufts or patches; spores acrogenous, simple or occasionally uniseptate, sometimes slightly catenulate, elliptical or oblong, colored, .0003 to .0008 in. long, .0002 to .0003 broad. Living leaves of oats, *Avena sativa*. Sevey. July.

In the affected plants, the apical part of the leaf first shows symptoms of disease. The tissues die and the color changes to rusty-red or dead-brown. This change goes on till the whole leaf is involved. Soon the minute and inconspicuous tufts of the fungus appear. In the southern part of St. Lawrence county, which was visited by the writer the past summer, scarcely a field of oats was free from this disease. So prevalent was it, that the general color of the fields was changed thereby, and it was the opinion of the owners that their oats were "rusting" badly. Upon close examination, however, no "rust" was to be found. In its stead the discoloration of the leaves and the fungus now described appeared. It is, apparently, a very injurious and destructive fungus. The mycelium is pale and provided with numerous conspicuous septa.

Cercospora granuliformis, E. and H.

Living leaves of violets, *Viola blanda*. Sevey. July.

Cercospora Apocyni, E. and K.

Living leaves of Indian hemp, *Apocynum cannabinum*. Whitehall. August. The hyaline character of the hyphæ indicate that the species belongs rather to *Cercospora*.

Sporodesmium antiquum, Cd.

Decaying wood. Flatbush. September. *Zabriskie*.

Macrosporium Polytrichi, n. sp.

Hyphæ erect, septate, somewhat nodulose, colored, .003 to .004 in. long, .0002 broad, forming continuous olive-green patches; spores extremely variable, elliptical, oblong or clavate, colored, 2 to 9 septate, with or without longitudinal septa, .0008 to .0024 in. long, .0003 to .0006 broad.

Capsules of moss *Polytrichum juniperinum*. Sevey. July.

Stilbum Spraguei, B. & C.

Dead stems of cabbage, *Brassica oleracea*. Menands. August.

The spores in our plant are elliptical, .00025 in. long. The receptacle becomes bay-red or chestnut color in drying.

Isaria aranearum, Schw.

On a dead spider. Manor. September.

Our plant does not agree rigidly with the description of *I. aranearum*, but the differences appear too slight to warrant its separation. The club is paler with scarcely any incarnate tint. The spores are very minute, .00012 to .00016 in. long, about half as wide.

Tubercularia carpogena, n. sp.

Receptacle minute, depressed, glabrous, subsuperficial, red; spores oblong or subfusiform, straight or slightly curved, .0004 to .0005 in. long, pointed at each end, produced on slender branched sporophores.

Ripe fruit of blackberry, *Rubus villosus*. Menands. August.

This appears at first sight like a minute species of *Peziza* or *Mollisia*. It discolors the affected drupes, making them red like itself. It is therefore easily overlooked.

Fusarium Scleroëdermatis, n. sp.

Sporodochia minute, convex, reddish-yellow or orange; sporophores somewhat branched, about as long as the spores; spores simple or with two or three obscure septa, slightly curved, very acute at each end, .0012 to .0018 in. long, .00016 broad.

On the peridium of *Scleroderma vulgaris*. Manor. September.

Gloeosporium leptospermum, n. sp.

Spots yellowish, small, irregular, subindeterminate; acervuli amphigenous, small, rotund, oblong or irregular, erumpent, brown or blackish; spores subcylindrical, slightly pointed, straight, colorless, .0008 to .001 in. long, .00016 broad.

Living fronds of *Pteris aquilina*. Sevey. July.

By its slender spores, this species approaches the genus *Cylindrosporium*.

Epicoccum purpurascens, Ehren.

Rind of decaying squashes. Menands. November.

Underwoodia, gen. nov.

Receptacle fleshy, more or less elongated, columnar or stem-like, externally uneven sulcate-costate or lacunose, everywhere ascigerous, internally excavated, lacunosely fistulose or containing several longitudinal cavities; asci eight-spored, paraphysate.

A genus of *Helvellaceæ*, allied to *Helvella*. It is as if the stem of *Helvella crispa* should be deprived of its pileus and entirely covered with an adnate hymenium, thus becoming a stemless receptacle; or as if the receptacle of a *Morchella* were greatly elongated and stemless.

Dedicated to Professor L. M. Underwood.

Underwoodia columnaris, n. sp.

[Plate 4. Figs. 1 to 4.]

Receptacle columnar, straight or slightly curved above, externally somewhat sulcate-costate or lacunosely uneven, whitish or brownish, within white, containing several longitudinal cavities, stemless; asci cylindrical, .007 to .008 in. long .0006 broad; spores elliptical verruculose, .0008 to .0009 in. long, .0005 broad, colorless, containing a single large nucleus.

Plant 4 to 6 inches high, 8 to 12 lines broad.

Among fallen leaves. Kirkville, Onondaga county. July.

Three specimens of this singular fungus were found by Professor J. T. Fischer. To facilitate their preservation by drying they were divided longitudinally. Halves of two of them were sent to me by Professor Underwood and from this material and from accompanying notes and sketches I have drawn up the description and figure. It is evidently a rare as well as a remarkable fungus.

Lachnella cerina, Phil.

Decaying wood of birch, *Betula lutea*. Cascadeville, Adirondack mountains. September.

Tapesia Rosæ, Phil.

Dead stems of wild rose. Lyndonville. May. Fairman.

Helotium mycetophilum, n. sp.

Receptacles gregarious, minute, .01 to .014 in. broad, sessile or with a very short stem, plane or convex, scarcely margined, yellowish externally, the hymenium orange; asci oblanceolate, .003 in. long, .0004 broad, paraphyses filiform; spores oblong-elliptical, simple, the endochrome sometimes divided, .0006 to .0007 in. long, about half as broad.

On old *Polyporous fomentarius*. Rainbow. August.

Much smaller than *H. citrinum* and distinguished from it by its larger spores and orange-colored hymenium. Also distinct from *H. episphæricum* by the character of the spores.

Cenangium rubiginosum, Cke.

Dead twigs of water beech, *Carpinus Americana*. Mechanicville. July.

Coronophora gregaria, Fckl.

Dead branches of mountain ash, *Pyrus Americana*. Cascadeville. July.

Hæmatomyces faginea, n. sp.

[Plate 4. Figs. 5 to 7.]

Tremelloid, cerebriform, one to two inches in diameter, gyrose-lobate, glabrous, shining, raisin color without and within; asci nearly cylindrical, eight-spored, .0024 in. long, .0003 broad; paraphyses slender, very slightly thickened above; spores generally uniseriate, narrowly elliptical, colorless, .0003 in. long, .00015 to .0002 broad.

Dead trunks of beech, *Fagus ferruginea*. Rainbow. August.

The plants are nearly as thick as they are broad and appear as if composed of several confluent individuals. The color resembles somewhat that of a ripe Catawba grape though darker. Without examination of the spores the plant might easily be taken for a species of *Tremella*. It shrinks very much in drying and is then very hard.

Barya parasitica, Fckl.

[Plate 4. Figs. 13 to 17.]

Parasitic on a sphæriaceous fungus, *Bertia moriformis*, on decaying wood of beech. Catskill mountains. September.

Our plant differs in some respects from Fuckel's figure and description of the species, yet it is apparently only a variety and not specifically distinct. The perithecia are crowded together in dense tufts or clusters and sometimes taper above into a rather long neck. The

asci and spores are far more slender and somewhat longer than those of the European plant as represented by Fuckel's figure and description. The globose termination of the ascus is at the apex, not at the base as Fuckel has it. Because of these differences I have given a figure of our plant and designated it as variety *cœspitosa*.

Hypoxylon effusum, *Nits.*

Decaying chestnut wood. Flatbush. September. *Zabriskie*. The smaller spores distinguish this species from *H. serpens*.

Eutypa flavovirescens, *Tul.*

Dead branches. Lyndonville. May. *Fairman*.

Eutypella longirostris, *n. sp.*

[Plate 4. Figs. 8 to 12.]

Stroma suborbicular, convex, formed of the slightly changed substance of the bark, whitish, covered by a black crust, often somewhat confluent in series; perithecia minute, globose, few or many in a stroma; ostiola elongated, fasciculately crowded, straight or flexuous, often fully one line long, radiately sulcate at the apex and sometimes sulcate on the sides also, black; asci clavate, pedicellate, the sporiferous part .0007 to .0009 in. long, .00016 broad; spores minute, curved, .0002 to .00025 in. long.

Bark of elm, *Ulmus Americana*. Sandlake. *Peck*. Syracuse. *Underwood*.

This is easily distinguished from the allied species by its very long ostiola and its very short asci and spores.

Anthostoma microsporum, *Karst.*

Dead bark of alder, *Alnus incana*. West Albany. May.

Cryptosporella hypodermia, *Sacc.*

Dead branches of slippery elm, *Ulmus fulva*. Copake Iron Works. June.

Leptosphæria dumetorum, *Niessl.*

Dead branches of cultivated honeysuckle. Lyndonville. May. *Fairman*.

Herpotrichia rhodomphalia, *Sacc.*

Decaying wood of locust, *Robinia Pseudacacia*. Yaphank. September.

Lophiotrema auctum, *Sacc.*

Dead stems of wild rose. Lyndonville. June. *Fairman*.

The three following species are extra-limital and are not yet to be included in the New York flora. Being considered new species it is desirable that descriptions of them should be published.

Lepiota farinosa, n. sp.

Pileus thin, rather tough, flexible, at first globose or ovate, then campanulate or convex, covered with a soft dense white floccose-farinose veil which soon ruptures, forming irregular, easily detensible scales, more persistent and sometimes brownish on the disk, flesh white, unchangeable; lamellæ close, free, white, minutely floccose on the edge; stem equal or slightly tapering upward, somewhat thickened at the base, slightly farinose, often becoming glabrous, hollow or with a cottony pith above, solid at the base, white, pallid or straw-colored, the annulus lacerated, somewhat appendiculate on the margin of the pileus, evanescent; spores subovate, .0004 to .0005 in. long, .0003 broad. Pileus 1.5 to 2.5 in. broad; stem 2 to 3 in. long, 2 to 4 lines thick.

Mushroom beds in a conservatory. Boston, Mass. March. Communicated by *E. J. Forster*.

This species is related to *L. cepæstipes*, from which it may be distinguished by its pileus which is not plicate on the margin and by its larger spores. It is edible. It is very distinct from *Amanita farinosa*.

Pholiota æruginosa, n. sp.

Pileus hemispherical or convex, obtuse, glabrous, greenish, becoming tinged with brown, sometimes slightly rimose-areolate, flesh pale or whitish, tinged with green; lamellæ broad, rounded behind, adnexed, pale ochraceous when young, becoming bright ferruginous or orange ferruginous; stem solid, glabrous or slightly fibrillose, somewhat sulcate-striate, colored like the pileus, sometimes curved, flexuous or caespitose; annulus slight, lacerated, evanescent; spores copious, bright ferruginous, subelliptical, .0003 to .00035 in. long, .00016 to .0002 broad.

Pileus .5 to 2 in. broad; stem 1 to 1.5 in. long, 2 to 3 lines thick.

Decaying railroad ties of oak. Trexlertown, Pennsylvania. October. *William Herbst*.

This species is remarkable for its greenish color and for its abundant bright colored spores, which sometimes fall upon and completely cover the surface of the lower pilei in a tuft. It is easily distinguished from *Stropharia æruginosa* by its solid stem, dry pileus and bright ferruginous lamellæ and spores. It belongs to the Section *Ægeritini*.

Phellorina Californica, n. sp.

Peridium subobconic, thin, even or slightly rimose-areolate, 9 to 12 lines high, 12 to 18 lines broad at the top, whitish becoming rusty-ochraceous, the vertex convex; stem nearly equal, solid but softer

within, clothed with a whitish bark, colored like the peridium with which it is continuous, 2.5 to 3 in. long, 4 to 5 lines thick; capillitium sparse; spores globose, ochraceo-ferruginous, .00025 to .0003 in. in diameter.

Mohave desert, California. *S. B.* and *W. F. Parish.* Communicated by *C. G. Pringle.*

Two specimens were collected in May, 1882. These were sent me in the dried state, but did not show the mode of dehiscence; but all the characters seen indicate that the plant is a *Phellorina*, differing from the published species in its obconic peridium and in the color of the spores. In *P. inquinans* these are described as golden yellow; in *P. erythrospora* and *P. squamosa* as brick-red. The peridium in all these is described as depressed-globose; but in our specimens it is more nearly the shape of a rather broad wine-glass. There are fragments of a whitish bark remaining on the stem, and appearances of a thinner one on the peridium. Where the bark has fallen the dry stem is sulcate-striate and rusty-ochraceous. Subglobose colorless cells, considerably larger than the spores, are intermingled with them. They are probably free basidia.

(D.)

REMARKS AND OBSERVATIONS.

Ranunculus repens, *L.*

A form of this species was found many years ago growing on the banks of the Erie canal between Rome and Oriskany. It was described in Beck's Botany under the name *Ranunculus Clintonii*. It is yet found in this locality, and also occurs by the roadside just at the southeastern limits of Rome.

A double-flowered form is sometimes seen in flower gardens and occasionally escapes from cultivation. It has been found in the streets of Bergen, Genesee county, and by the side of the railroad at Union Church, Albany county. In the latter case its origin can be traced to a neighboring flower garden.

Cardamine hirsuta, *L.*

A tall, leafy and very glabrous form. Menands. July.

Rhus Toxicodendron, *L.*

The entire-leaved variety occurs at Yaphank, Long Island. It has been reported to me as comparatively harmless so far as poisonous quality is concerned, and my experience in handling it was entirely without harm.

Trifolium hybridum, L.

A white-flowered form. Whitney's Point. June.

Lythrum alatum, Pursh.

This western plant is well established at Selkirk, Albany county.

Sium cicutæfolium, Gmel.

Var. *brevifolium*. Leaflets lanceolate or linear-lanceolate, one inch or less in length. Cedar Lake, St. Lawrence county.

Carum carui, L.

A form with pinkish-tinted flowers. Feurabush, Albany county. Also near East Bloomfield, Ontario county.

Diodia teres, Walt.

Manor, L. I. This plant is apparently a recent introduction in this locality. It occurs also on Staten Island.

Solidago nemoralis, Ait.

This species is quite variable. A form was found near Yaphank in which the panicle is greatly elongated, being a foot or more in length. It is leafy below and in this respect simulates *S. caesia*.

Solidago puberula, Nutt.

This golden-rod is quite common on the eastern part of Long Island. Its general appearance, except in the color of the flowers, is quite similar to that of *S. bicolor*. It also occurs on the Shawangunk and Catskill mountains and is very abundant in the Rainbow lake region of the Adirondacks. In this locality it is less puberulent and flowers about a month earlier than on Long Island.

Solidago speciosa, Nutt.

Var. *angustata* was found on Long Island, near Baiting Hollow station. Its narrow virgate panicle appears at first sight quite similar to that of *S. puberula*.

Achillea millefolium, L.

Near Colton, St. Lawrence county. The form with red ray flowers, which give it an ornamental appearance.

Plantago lanceolata, L.

A singular form with compound ovate spikes. Whitney's Point.

Potamogeton zosteræfolius, Schum.

Cedar lake, St. Lawrence county. July.

Juncus effusus, L.

A form with distinctly striate scapes and densely crowded panicles, but the pods scarcely pointed. It is, therefore, intermediate between the typical form and the variety *conglomeratus*. Rainbow. August. *Juncus filiformis* occurs in the same locality.

Juncus acuminatus, Mx.

Wet ground. Selkirk. July. The variety *legitimus* with heads of numerous flowers.

Juncus scirpoides, Lam.

A few plants of the variety *macrostemon* of this, with us, rare species were found in wet sandy soil near Yaphank. September.

Botrychium matricariæfolium, A. Br.

Ray Brook, Essex county. Both this species and the allied *B. lanceolatum* are now known to occur in the Adirondack region.

Clitocybe laccata, Scop.

This is an exceedingly variable species, and it might be well to designate some of the strongly marked variations by name. Variety *pallidifolia*. Lamellæ whitish or pallid, decurrent. Selkirk.

Omphalia striipilea, Fr.

Var. *albogrisea*. Pileus pale gray. Prostrate trunks of maple, *Acer saccharinum*. Rainbow. August.

Coprinus micaceus, Fr.

The pileus is sometimes sprinkled with more or less persistent squamules. The micaceous particles are not always clearly discernible on it.

Coprinus fimetarius, Fr.

Of this very variable species there is a small form growing on decayed wood in woods. It has the spores rather smaller than in the type, they being .0004 to .00045 in. long, .0003 broad. It might be designated var. *silvicola*.

Cortinarius croceus, Schæff.

Most authors consider this a variety of the very variable *C. cinnamomeus*. The form of it mentioned by Fries as having the stem and lamellæ olivaceous occurs in sphagnous swamps between Rainbow lake and Jones' pond.

Lactarius fuliginosus, Fr.

A form with the pileus colored like that of *Lactarius lignyotus*, but with the lamellæ much closer than in that species was found in a swamp near Sevey. July.

Hygrophorus Cantharellus, Schw.

This is very common in the Adirondack region and is also very variable in color. In wet weather it is plentiful in groves of poplar, especially where there is an undergrowth of brakes, *Pteris aquilina*.

Var. *flava*. Pileus and stem pale yellow; lamellæ arcuate, strongly decurrent.

Var. *flavipes*. Pileus red or reddish; stem yellow.

Var. *flaviceps*. Pileus yellow; stem red or reddish.

Hygrophorus miniatus, Fr.

This species is also common in the Adirondack region and often has the pileus one to two inches broad. It sometimes grows in circles and is frequently cæspitose, in which case the stem is apt to be compressed or irregular. Its bright colors render it very attractive. The pileus is often minutely squamulose or roughened with a yellowish scurf. The lamellæ are yellowish, or yellow tinged with red.

Lentinus strigosus, Schw.

This species was described from specimens that grew on trunks of the tulip tree. It is not rare with us, growing on stumps, trunks and branches of birch, oak and other deciduous trees. It was found this season growing on trunks of balsam fir at Ray Brook, Essex county.

Boletus speciosus, Frost.

Var. *brunneus*. Pileus brown; otherwise like the type. Sevey. July.

Polyporus perennis, Fr.

The pileus sometimes becomes whitish or grayish-white with age. Sevey. July.

Polyporus sulphureus, Fr.

This showy species occurs on both hard and soft wood. It sometimes protrudes from dead spots in standing living trees, especially of oak, chestnut and cherry. The yellowish milk or juice is not always present.

Polystictus versicolor, Fr.

Var. *fumosiporus*. Pores smoky-brown; otherwise as in the type. Catskill mountains. September.

Poria mutans, Pk.

Var. *tenuis*. Very thin, tender, the margin often wide and downy. Bark and wood of spruce, *Picea nigra*. Sevey. July.

The species appears to differ from *P. cruentata* Mont. in having the pores and subiculum of one uniform yellowish or subochraceous color, which changes where bruised or in drying to a dull red or subincarnate hue.

***Solenia fasciculata*, Pers.**

On old pilei of *Polyporus piceinus*. Sevey. July.

***Stemonitis Morgani*, Pk.**

Fine large specimens of this species were found on an alder trunk, near Catskill. June.

***Septoria Violæ*, West.**

Var. *oligocarpa*. Spots small, white; perithecia few, black. Living leaves of *Viola blanda*. Sevey. July. .

***Geoglossum luteum*, Pk.**

Var. *fumosum*. Club smoky yellow, less compressed; stem dingy, scarcely squamulose.

Mossy banks, Adirondack mountains. August.

***Cenangium balsameum*, Pk.**

Var. *abietinum*. Receptacles smaller than in the type, externally clothed with a yellowish-green pulverulence when young, naked and black when old; spores subclavate.

Dead branches of hemlock, *Tsuga Canadensis*. Whitehall. August. *Gelatinosporium abietinum* was associated with it.

***Sphærotheca pruinosa*, C. & P. .**

The typical form was found on leaves of *Rhus glabra*. Specimens have now been found on living leaves of the staghorn sumach, *Rhus typhina*. In these the mycelium is a little more dense. Plattsburgh. August.

(E.)

NEW YORK SPECIES OF ARMILLARIA.

***Armillaria*, Fr.**

Hymenophorum continuous with the stem. No universal veil; partial veil forming an annulus, sometimes only indicated by the scales which adorn the stem and terminate above in the form of a ring. Spores white.

This genus is separated from *Amanita* and *Lepiota* by the absence of a universal veil and by the lamellæ which are attached to the stem. The three sections, in which the species were grouped by Fries, closely correspond respectively to the three genera *Tricholoma*,

Clitocybe and Collybia. From these they are distinguished by the presence of an annulus. They are also separated from Pholiota and Stropharia by their white spores.

Our species are few, and with one exception very rare. Three have been found in New York; eight in the United States. Most of the species grow on the ground; some on both wood and ground.

The name *Armillaria* is derived from the Latin *armilla*, a bracelet, and has reference to the annulus or ring that encircles the stem.

SYNOPSIS OF THE SPECIES.

- | | |
|---|-----------------------|
| Pileus wholly white, glabrous | <i>A. ponderosa</i> . |
| Pileus not wholly white or not glabrous | 1 |
| 1 Pileus adorned with dark spots, margin even | <i>A. nardosmia</i> . |
| 1 Pileus adorned with hairy squamules, margin striate . . . | <i>A. mellea</i> . |

Armillaria ponderosa, *Pk.*

HEAVY ARMILLARIA.

Report 26, p. 50. *Agaricus magnivelaris*, Rep. 29, p. 66.

Pileus thick, compact, convex or subcampanulate, smooth, white or yellowish, flesh white, the naked margin strongly involute, the slightly viscid veil persistent; lamellæ crowded, narrow, slightly emarginate, white inclining to cream color; stem stout, subequal, firm, solid, coated by the veil, colored like the pileus, white and furfuraceous above the annulus; spores nearly globose, .00016 in. in diameter.

Pileus 4 to 6 in. broad; stem 3 to 5 in. long, about 1 in. thick. Ground in woods. Columbia county. October.

The veil conceals the young lamellæ for a long time, and finally becomes lacerated and adheres in shreds or fragments to the stem and the margin of the pileus. This species has not been found since its discovery in 1872. In the Twenty-ninth report its name was changed to *Agaricus magnivelaris*, that it might not conflict with *Agaricus ponderosus* of Persoon; but as that is manifestly a species of *Tricholoma*, the giving of generic value to the subgenera of Fries permits the restoration of the original name to this species.

Armillaria nardosmia, *Ellis*.

NARD-SMELLING ARMILLARIA.

Torr. Bull. Vol. VI, p. 75. *Agaricus rhagadiosus*. Report 33, p. 18.

Pileus fleshy, firm, thick and compact on the disk, thin toward the margin, whitish variegated with brown spots, with a thick, tough and separable cuticle, flesh white; lamellæ crowded, subventricose,

slightly emarginate, whitish; stem solid, fibrous, not bulbous, sheathed below by the brown velvety veil, the annulus narrow, spreading, uneven on the edge; spores subglobose, .00025 in. in diameter.

Pileus about 3 in. broad; stem 1.5 to 3 in. long, 4 to 6 lines thick.

Ground in woods, Suffolk county. September.

This species is perhaps not specifically distinct from the European *Armillaria rhagadiosa*, to which it was referred in the Thirty-third Report, and with the description of which it agrees very closely, but that species is said to grow on trunks of trees, and to have the lamellæ decurrent. This I find only solitary on the ground, with lamellæ merely adnate or subdecurrent and with spores subglobose and about .00025 in. in diameter. No description of the European plant, so far as seen by me, gives the character or dimensions of its spores. Mr. Ellis remarks that the fresh plant has an aromatic odor like spikenard. *A. rhagadiosa* is also said to have a strong aromatic odor.

***Armillaria mellea*, Vahl.**

HONEY-COLORED ARMILLARIA.

Hym. Europ. p. 44. Syl. Fung., Vol. V, p. 80.

Pileus fleshy, rather thin except on the disk, at first hemispherical or subconical, then convex or nearly plane, adorned with numerous hairy squamules, mostly striate on the margin, pale-yellowish, dingy-yellowish or honey-color or reddish-brown, flesh whitish, taste unpleasant; lamellæ subdistant, adnate or decurrent, whitish or pallid, often with rufescent spots when old; stem equal or slightly thickened at the base, stuffed or hollow when old, sometimes floccose-squamose, externally fibrous, pallid or brownish; spores .0003 to .0004 in. long, .0002 to .00025 broad.

Pileus 1 to 6 in. broad; stem 1 to 6 in. long, 3 to 10 lines thick.

Ground and decaying wood. Common. Late summer and autumn.

This species, like many others that are plentiful and have a wide geographical range, is extremely variable. In its mode of growth it is either solitary gregarious or cæspitose. It occurs both on the ground and on decaying wood of various trees, in woods and in cleared lands. It is especially abundant in recent clearings in hilly and mountainous districts, where it often forms large tufts composed of many individuals closely crowded together, growing especially about stumps and prostrate trunks. It is sometimes very small, having a pileus scarcely more than an inch broad, and a stem but an inch or two long. Again, it is of monstrous

size, especially when solitary. Tufts a foot or more in diameter are not at all uncommon. I have seen them so abundant in the Adirondack region that they might easily have been gathered by the bushel.

The pileus is generally adorned with numerous rather small or minute hairy tufts or scales, which are mostly brown or blackish and more dense on the disk than toward the margin. Sometimes they are so crowded on the disk, especially in young plants, that they give a blackish or darker hue to that part of the pileus. In some forms of the species these hairy scales are wanting or they disappear with age, especially in wet weather, thus leaving the pileus glabrous. The margin of the pileus is normally striate, but forms occur in which it is even. *Armillaria laricina* Bolt, has a glabrous pileus with even margin, but it is regarded by Fries as a mere variety of this species, and the figure of *A. mellea*, as given in Berkeley's Outlines, table 4, indicates the correctness of this view. Occasionally the disk is somewhat prominent or subumbonate. In young specimens and in wet weather the pileus is frequently found moist or subhygrophanous. In color it varies from almost white, through intermediate shades, to a dark reddish-brown. The lamellæ are sometimes clearly emarginate, sometimes broadly adnate or even decurrent. They are generally whitish or more or less tinged with yellow. When old they are sometimes stained with brownish-red spots and dusted with the white spores. The stem varies considerably in color. It often assumes a brown or livid-brown color, especially toward the base or when old. Externally it is rather firm and fibrous, but within it is paler, spongy or even hollow. It is sometimes adorned with pale floccose scales, but these are apt to disappear with age. The veil is usually well developed and membranous, and in the mature plant encircles the stem like a spreading collar, but sometimes it is very thin, soon lacerated and somewhat evanescent. Occasionally it is of a webby character as in *Cortinarius*, and it is then more or less fugacious. Thus it is possible to find specimens of this species with the stem destitute of an annulus much to the disgust and perplexity of young students of mycology. In young plants the veil often entirely conceals the lamellæ. It is generally white or whitish, but sometimes it is stained about the edges with greenish yellow or olivaceous. The tomentum at the base of the stem also presents, in some specimens, the same hue.

Abnormal forms of the species sometimes occur. An abortive form consists of whitish irregular subglobose masses of cellular matter without any distinction of stem pileus or lamellæ. This corresponds

to the abortive form of *Clitopilus abortivus*. It grows in company with the normal form. This fungus is regarded as destructive to the wood in which its mycelium lives.

Authors disagree as to its edible qualities. Badham says that it is a nauseous disagreeable fungus, however cooked, and that it is so repugnant to our notions of the savory that few would make a second attempt or get dangerously far in a first dish. Letellier says that all authors have indicated this mushroom as dangerous.

Richon and Rosé say that its taste is styptic and the acidity does not entirely disappear in cooking. The species is edible, but its quality is very indifferent. According to Vittadini it is preserved in vinegar, salt and oil for use in winter and its acidity is lost in cooking.

Gillet says that it has for a long time passed as poisonous and that modern botanists still disagree as to its properties, but in reality it is harmless, though it has an acrid disagreeable taste which disappears in cooking.

Stevenson says it is edible but tough.

Cordier says it is edible and loses its acidity in cooking, but the stems are tough and not used.

Dr. Curtis classes it with the edible species.

I have myself eaten it at different times, both fried and stewed, and always without harm. Though not unpleasant to my taste at the time of eating, it afterwards leaves an unpleasant burning sensation in the throat which lasts a short time.

It is not improbable that such a variable plant may differ somewhat in its properties in different localities and according to its different habitats. Its toughness also may vary according to the age of the specimens and the rapidity of their growth. These differences may account in part for the different estimate which has been made of it. Tastes also differ in different individuals. In my own case, only the pilei of young or barely mature specimens were used.

In the Adirondack region I have seen large tufts of this species without pilei. Some animal of considerable size, probably deer, had eaten the pilei, and recognizing the toughness and unfitness of the stems had left them standing where they grew.

SYNOPSIS OF THE UNITED STATES SPECIES OF ARMILLARIA.

Pileus white or whitish.....	1
Pileus some other color	4
1. Pileus viscid.....	A. mucida.
1. Pileus not viscid.....	2

- | | |
|---|----------------|
| 2. Pileus adorned with blackish scales..... | A. ramentacea. |
| 2. Pileus variegated with brown spots..... | A. nardosmia. |
| 2. Pileus without spots or scales | 3 |
| 3. Annulus broad, persistent | A. ponderosa. |
| 3. Annulus narrow, deciduous | A. constricta. |
| 4. Pileus glabrous | 5 |
| 4. Pileus adorned with hairy squamules..... | A. mellea. |
| 5. Stem bulbous | A. bulbiger |
| 5. Stem not bulbous..... | A. robusta. |

(F.)

NEW YORK, December 9, 1889.

CHAS. H. PECK, *State Botanist*:

MY DEAR SIR.—The growth of fungi on railroad ties, bridge, car and station timbers was unusually prolific the past season, with its large rainfall. Therefore a corresponding increase in the rate of decay, the effects of which will be more apparent next year. The fruiting of *Lentinus lepideus* Fr., on ties of yellow pine, *Pinus palustris*, Mill. in main-line tracks was so conspicuous in September, 1889, as to be noticeable from the trains. Pilei six to eight inches in diameter were frequent, while four in a cluster of smaller diameter, springing from the same mycelium, seemed to be a common mode of growth, this unusually wet season. One pileus in a place is the usual manner of growth in the railroad tracks in an ordinary season. The resinous matter in yellow pine in its natural state does not seem to check the growth of this fungus.

Agaricus campanella Batsch. was found on white cedar, *Chamæcyparis sphaeroidea* Spack. fruiting from May to October. White Oak, *Quercus alba* L. frequently showed *Polyporus applanatus* Fr. in fruit, while *Polyporus versicolor* Fr. was very abundant. The absence of fungi in fruit upon ties of chestnut, *Castanea vulgaris* var. *Americana* A. D. C. was as striking as its frequency was on other woods. It is a well-known fact that chestnut ties last longer where the ground is damp, than where it is dry. It will be important to observe next year whether the excessive rain of this season has retarded or increased the usual rate of decay in ties of chestnut. One fact is established now; that the wood has been softened by the rain and the abrasion under the rails increased. On the railroad bridges the fungus *Lenzites sepiaria* Fr. has been abundant and destructive. Under the station platforms and the planking of the walks the development of mycelium, generally without fruiting, has been more abundant than usual. It has not, however, set men to thinking as it should, and the

replanking has been done as of old, that is, in the best manner to promote the growth of a new crop of fungi to destroy the planks in a year or two. The season has been so favorable to the growth of mycelium that unseasoned timbers, used for the construction of freight cars, though dressed and framed, but closely piled in the shop one or two weeks, awaiting erection, would show traces of a developing mycelium. The strength of the pieces would not be impaired in so short a time, and little notice would be taken of the presence of the mycelium. If the timber finally seasons the mycelium becomes inert and will not revive till moisture reaches it. This would again start decay. If the unseasoned wood is painted and the moisture retained, the mycelium will continue to grow, causing partial or complete decay in the wood. This was clearly shown in the examination of several hundred freight cars undergoing repairs. Internal growth of fungi had taken place in heavy timbers which were thereby weakened and so quickly failed in service. A general impression prevails that timbers only need protection from external decay. Careful microscopical study reveals the fact that nearly every stick of timber contains in the crevices or on the surface a sufficient number of spores or traces of mycelium to induce decay when painted, unless the wood is well seasoned or properly treated. In New York city, timbers have been put in houses and other buildings and covered with tar or tarred paper, which caused their decay in three to four years. Notably, an apartment house was so badly injured by the development of fungi in the large timbers covered by tarred paper, that it had to be taken down in the fourth year of its use. Buildings eight to eleven stories high, in which every floor will be heated to seventy degrees or more in the winter, furnish a temperature sufficient for the growth of the most destructive fungi for the entire year. Unless the timbers are seasoned or properly treated, the fungi will grow and cause the decay of the wood. These fungi have so long been considered the accompaniment of the decay of the wood, instead of the *cause* thereof, that by the majority of the users of wood the true functions of the fungi are not understood.

In view of the fact that the State finds it necessary to take active measures to preserve our rapidly decreasing forests, it seems to me it might with propriety take active measures to call attention to the destruction caused by fungi in timber and so check what is now a great and unnecessary waste. Many of the means of doing this are simple and inexpensive, as stated in my letter of December 5, 1887.

As an illustration of simple and effective measures, I will give an example: When I was chief engineer of the Valley Railway of Ohio,

I built some extensive trestles. This was in 1873. Before doing so I examined a number of trestles near Cleveland, Ohio, built of 10 by 12 or 12 by 12 timbers, the life of which did not exceed seven or eight years. In examining them I found that while the large timbers were sound upon the outside, internally they were all decayed. The small timbers, 6 by 8, used for braces and of the same kind of wood, were sound. *The small size enabled them to season in the structure.* This was an important fact, so I made all of my timbers small, using more of them to give the proper factor of safety. One of those trestles is in use now, 1889. In this case one of the three essentials requisite for the growth of fungi was eliminated, namely, the moisture in the interior. Decay could not, therefore, take place. The first step to be taken in this important matter has already been, in great measure, done by you, namely, the collection of specimens and the classification of the species of fungi. This, supplemented by a series of specimens showing how the wood is destroyed, would form the basis of one of the most important and economic departments of the State Museum. The second step would be the dissemination of this knowledge to the railroad companies and other consumers of wood.

Yours truly.

P. H. DUDLEY.

EXPLANATION OF PLATE 1.

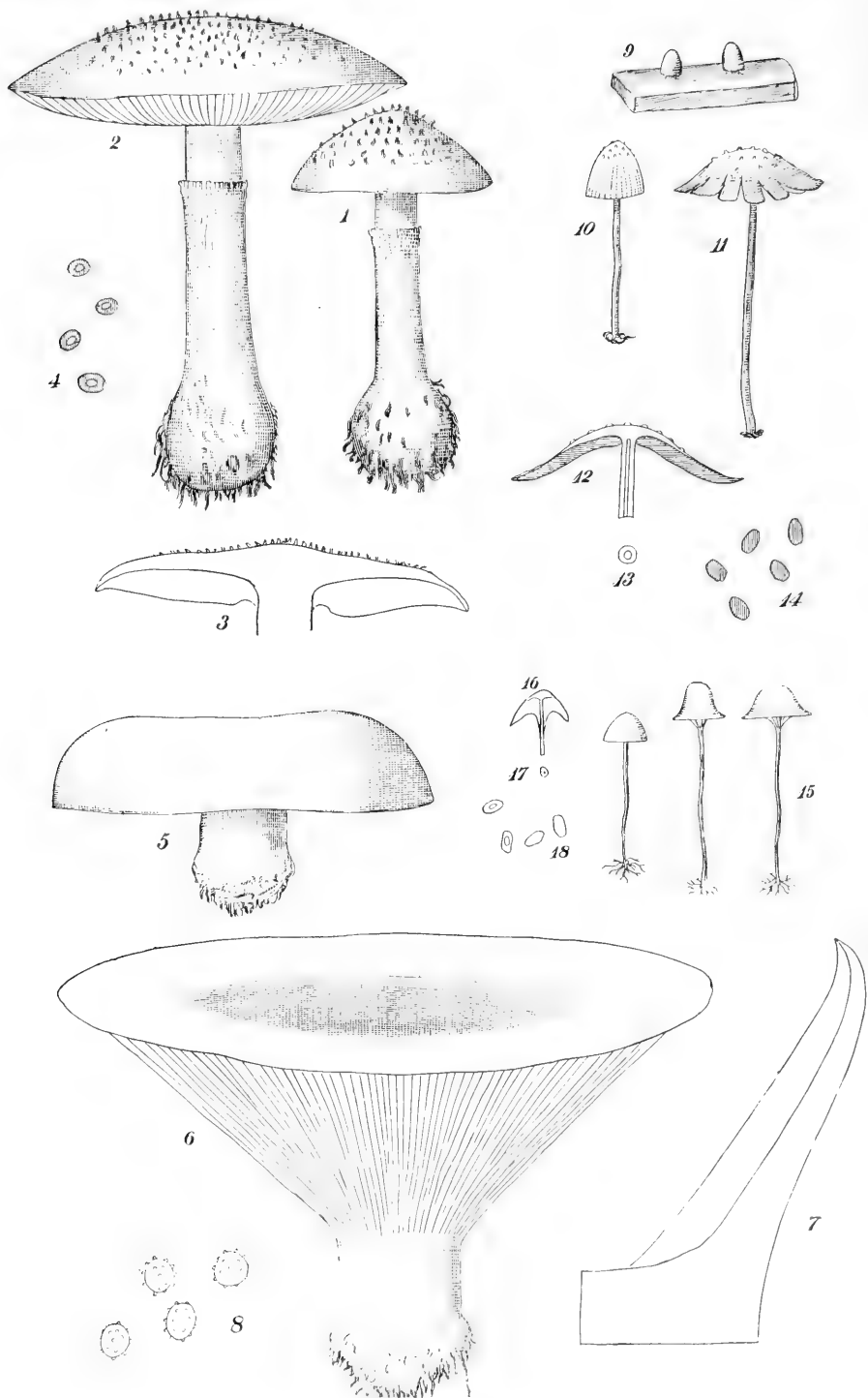
LACTARIUS MUTABILIS, *Peck.*

- Fig. 1. An immature plant.
- Fig. 2. A mature plant.
- Fig. 3. Vertical section of a pileus and upper part of its stem.
- Fig. 4. Four spores x 400.

TRICHOLOMA GRAVE, *Peck.*

- Fig. 5. An immature plant.
- Fig. 6. A mature plant.
- Fig. 7. Vertical section of one-half a pileus.
- Fig. 8. Four spores x 400.





EXPLANATION OF PLATE 2.

CORTINARIUS ANNULATUS, *Peck.*

- Fig. 1. An immature plant.
Fig. 2. A mature plant.
Fig. 3. Vertical section of a pileus and upper part of its stem.
Fig. 4. Four spores $\times 400$.

RUSSULA BRÉVIPES, *Peck.*

- Fig. 5. An immature plant.
Fig. 6. A mature plant.
Fig. 7. Vertical section of half a pileus.
Fig. 8. Four spores $\times 400$.

COPRINUS BRASSICÆ, *Peck.*

- Fig. 9. Fragment of stem bearing two very young plants.
Fig. 10. A plant with the pileus unexpanded.
Fig. 11. A plant with the pileus expanded.
Fig. 12. Vertical section of a pileus and upper part of its stem enlarged.
Fig. 13. Transverse section of a stem enlarged.
Fig. 14. Five spores $\times 400$.

MARASMIUS ALBICEPS, *Peck.*

- Fig. 15. Three plants showing different forms of the pileus.
Fig. 16. Vertical section of a pileus and upper part of its stem.
Fig. 17. Transverse section of stem.
Fig. 18. Four spores $\times 400$.

EXPLANATION OF PLATE 3.

COMATRICHA LONGA, Peck.

- Fig. 1. Piece of wood bearing a tuft of the plants.
Fig. 2. Upper part of a columella and capillitium enlarged.
Fig. 3. Lower part of a stem and fragment of hypothallus enlarged.
Fig. 4. Small fragment of the columella and capillitium x 400.
Fig. 5. Four spores x 400.

COMATRICHA SUBOESPITOSA, Peck.

- Fig. 6. Piece of wood bearing four clusters of the plants.
Fig. 7. A plant after its spores have fallen, enlarged.
Fig. 8. Small fragment of the capillitium x 400.
Fig. 9. Four spores x 400.

STACHYBOTRYS ELONGATA, Peck.

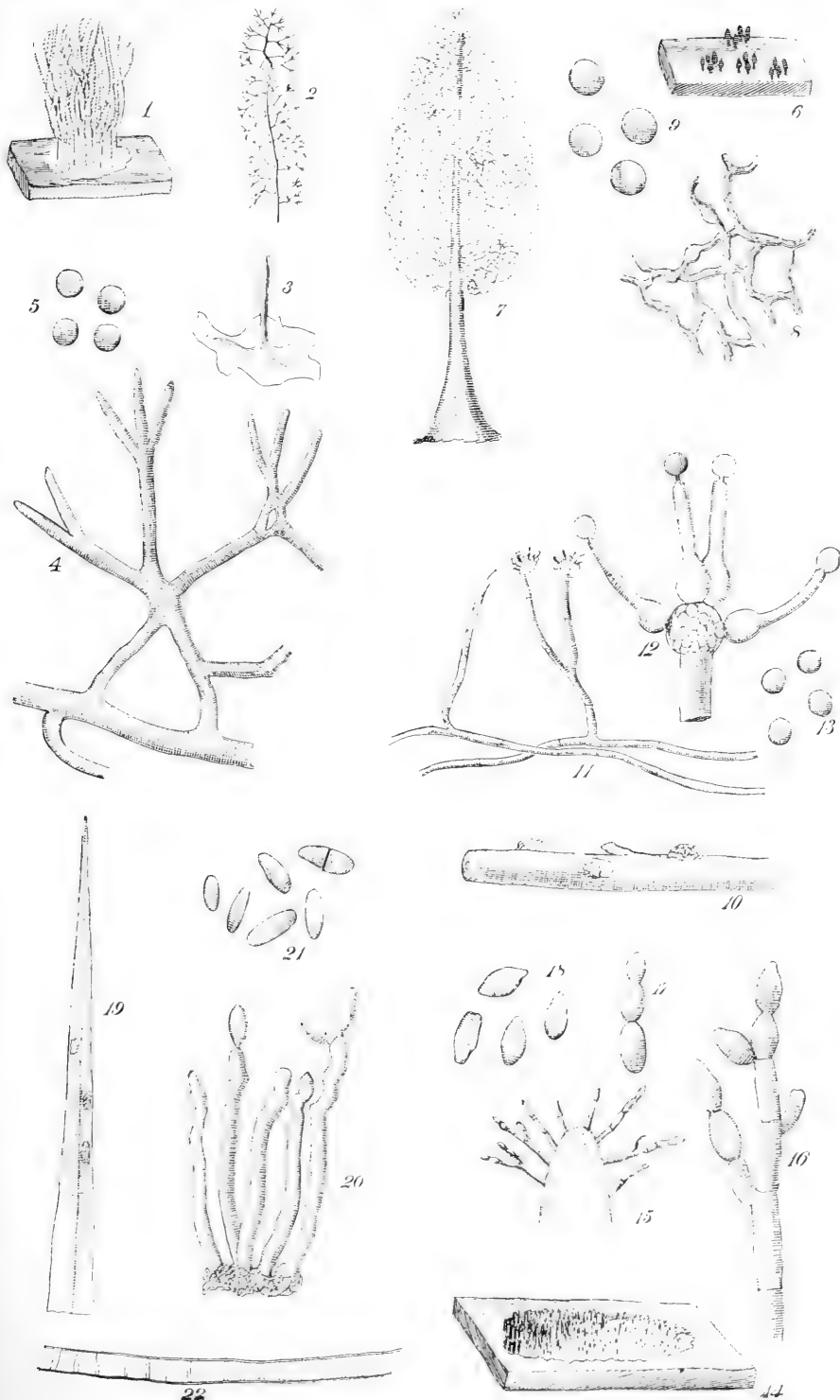
- Fig. 10. Piece of branch bearing three tufts of the plants.
Fig. 11. Fragments of hyphæ, one bearing two heads of spores, enlarged.
Fig. 12. Apex of a fertile hypha partly denuded, four sporophores with their spores remaining x 400.
Fig. 13. Four spores x 400.

DEMATIUM PARASITICUM, Peck.

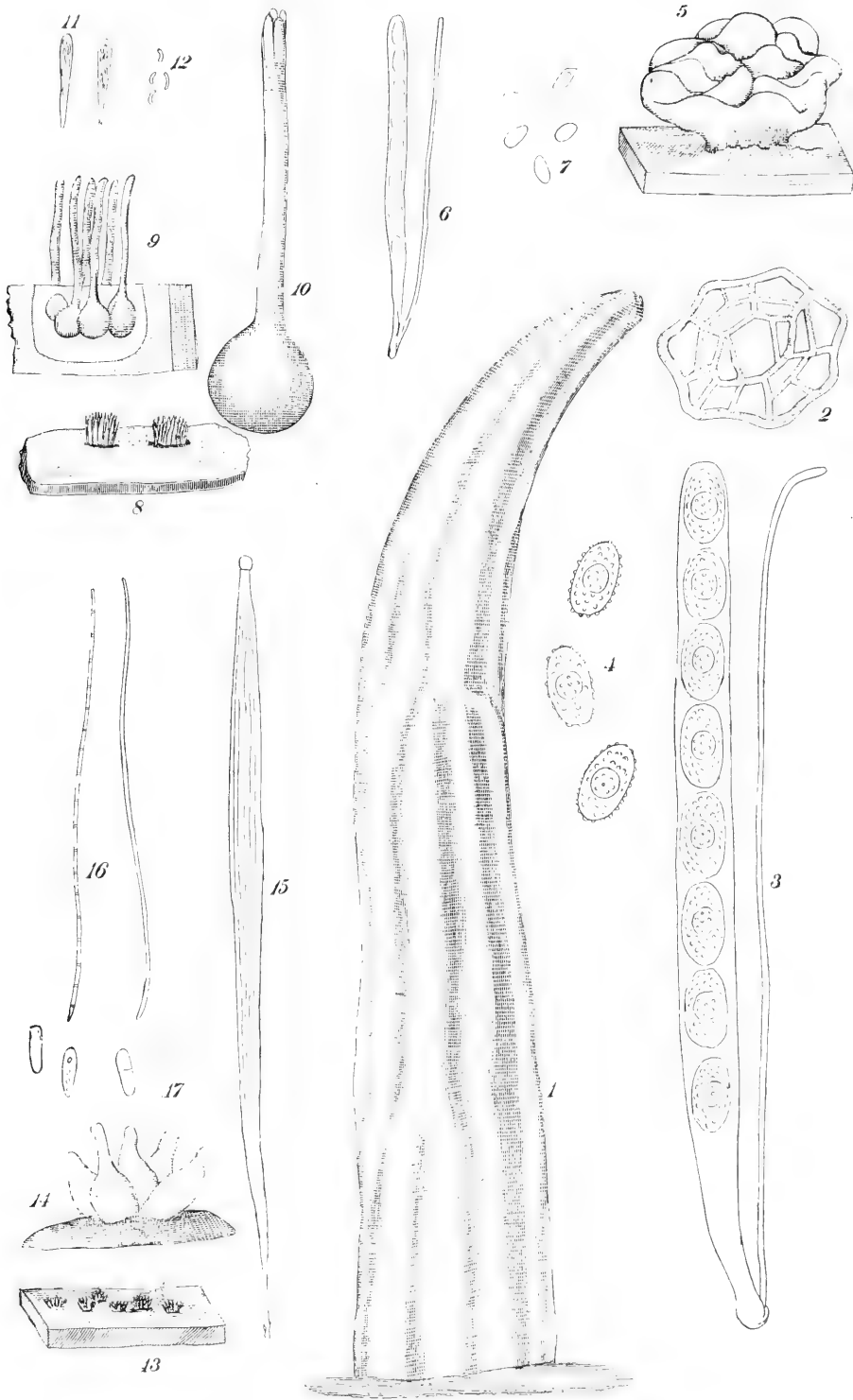
- Fig. 14. Piece of wood bearing the Hydnum, a part of whose aculei are blackened by the parasite.
Fig. 15. An aculeus with eight hyphæ of the parasite, enlarged.
Fig. 16. A hypha bearing five spores x 400.
Fig. 17. A chain of three spores x 400.
Fig. 18. Four spores x 400.

FUSICLADIUM DESTRUENS, Peck.

- Fig. 19. Upper part of a leaf bearing three clusters of the fungus.
Fig. 20. Five hyphæ, two of them bearing spores x 400.
Fig. 21. Six spores x 400.
Fig. 22. A fragment of mycelium x 400.







EXPLANATION OF PLATE 4.

UNDERWOODIA COLUMNARIS, *Peck.*

- Fig. 1. A mature plant.
Fig. 2. Transverse section of a plant.
Fig. 3. A paraphysis and an ascus with its spores x 400.
Fig. 4. Three spores x 400.

HEMATOMYCES FAGINEA, *Peck.*

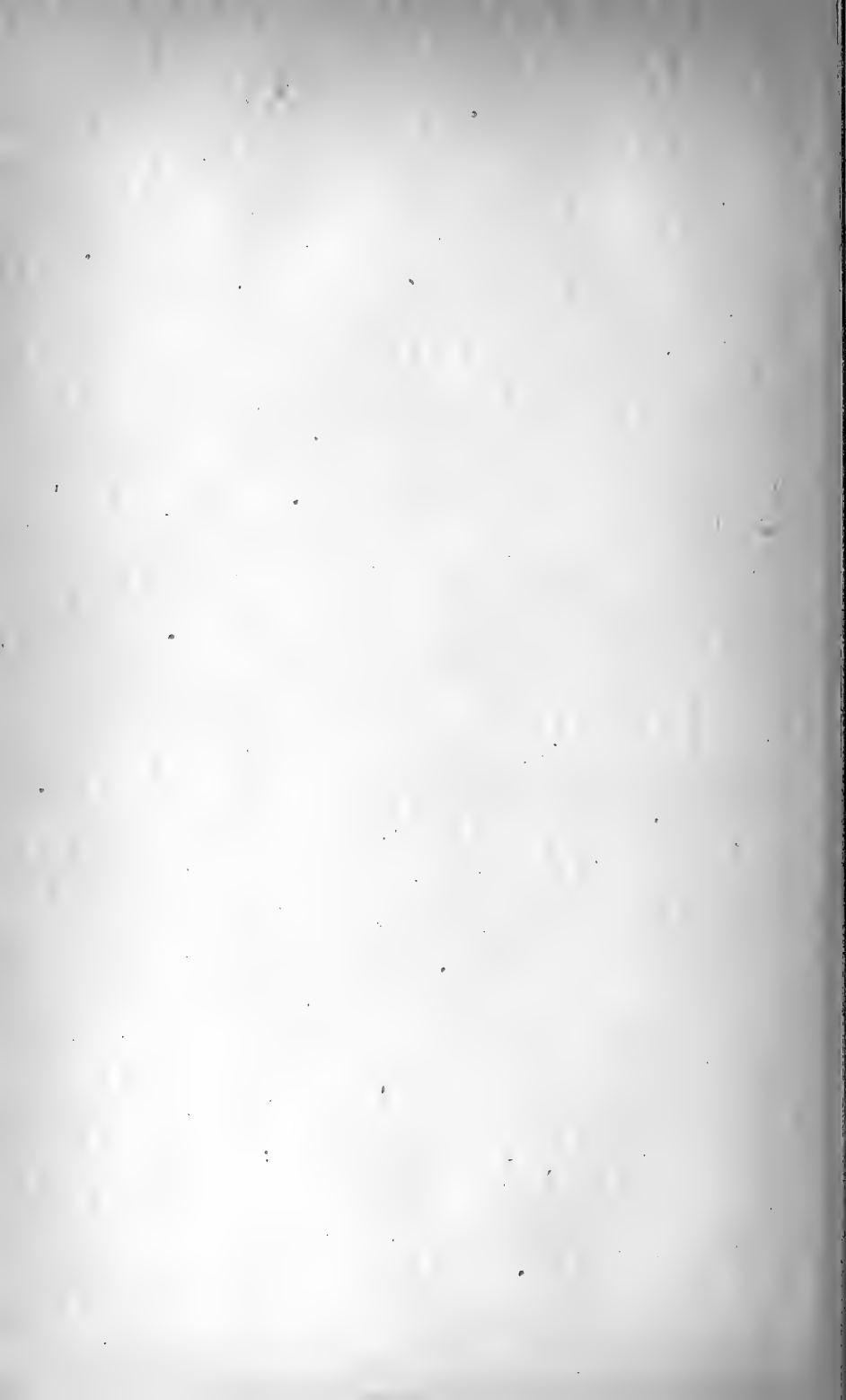
- Fig. 5. Piece of wood bearing the fungus.
Fig. 6. A paraphysis and an ascus with its spores x 400.
Fig. 7. Five spores x 400.

EUTYPELLA LONGIROSTRIS, *Peck.*

- Fig. 8. Piece of bark bearing two clusters of the fungus.
Fig. 9. Vertical section through a cluster, enlarged.
Fig. 10. A perithecium and its ostium, enlarged.
Fig. 11. Two asci with their spores x 400.
Fig. 12. Four spores x 400.

BARYA PARASITICA *Fekl.* var. *CAESPITOSA* *Peck.*

- Fig. 13. Piece of wood bearing six clusters of the fungus.
Fig. 14. A cluster of five perithecia, enlarged.
Fig. 15. An ascus with its spores x 400.
Fig. 16. Two spores x 400.
Fig. 17. Four conidia x 400.



REPORT

OF THE

STATE ENTOMOLOGIST

TO THE

Regents of the University, State of New York,

FOR THE YEAR 1889.



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R E P O R T.

OFFICE OF THE STATE ENTOMOLOGIST, }
ALBANY, December 7, 1889. }

To the Honorable the Regents of the University of the State of New York:

GENTLEMEN.—I have the honor of presenting to your board my Sixth Report on the Injurious and Other Insects of the State of New York.

I have again the privilege of recording the exemption of the crops of the State from any widespread serious insect attack, and a mitigation of some of the more formidable ones of preceding years.

Injuries to cereal crops have been remarkably few and local. While in several of the other States, as notably in Ohio, Indiana, and Illinois, the grain-aphis, *Siphonophora avenæ* (Fabr.) has been unusually destructive to wheat, oats and other of the grains, and it has also appeared in injurious numbers in New Jersey and in Pennsylvania, not a single instance of its occurrence in the State of New York has been reported to me.

The hop-aphis, *Phorodon humuli* (Schrank), which was the occasion in 1886 of almost the entire destruction of the hop crop of the State, again appeared during the month of July in the hop-yards of Schoharie and Montgomery counties in such numbers as to excite great alarm. Recommendation was made by the Entomologist and circulated through the local press, of earnest effort to arrest the attack in its then existing stage, by promptly and thoroughly spraying the infested vines with insecticidal washes; but fortunately this measure, attendant with considerable labor, was not found necessary, for the heavy rains that set in at the time, and continued for weeks thereafter, proved fatal to most of the hop-lice, and speedily rescued the crop from its threatened destruction.

In neglected orchards—in which category most of the orchards of our State find place—fruit insects have abounded to the extent that the fruit gathered, carried to market and sold, has, in

many instances been in a condition that rendered it absolutely unfit for table use—only suitable for feeding to animals who have not the privilege of selecting their food. At the same time, the intelligent and enterprising fruit-grower has been able to meet his hosts of insect enemies and triumph over them by means of the spraying devices and the insecticidal washes that the recent experiments and studies of our economic entomologists have placed in his hands and directed him how to use. The ravages of the apple-worm can now be so easily controlled, that worm-eaten apples should henceforth serve as an attestation of the ignorance, thriftlessness, or laziness of their grower. The destructive and dreaded plum-cureculio is being so successfully fought that it will probably soon be brought under similar control.

May I, in the above connection, offer to the notice of your board an illustration of the benefit that may result from entomological studies in the promotion of the material interests of our people.

A scale-insect, known popularly from its peculiar appearance, as "the cottony-cushion scale," and scientifically as *Icerya Purchasi*, chanced, about twenty years ago, to be brought into California, on an acacia from Australia. From this plant it spread to various other plants, shrubs, and trees, "attacking almost everything," but manifesting a decided preference for the orange. It especially multiplied to such a degree upon the orange trees that within the last few years many thousands of them have been killed, and entire orchards broken up and abandoned. Every possible means known to science, in the use of washes or other applications, that gave promise of killing the insect, was resorted to, even to the costly experiment of constructing portable canvas tents of a capacity for inclosing the largest trees, and forcing within them, by the aid of an apparatus devised for the purpose, the deadly vapor of hydrocyanic acid gas. Yet notwithstanding all that science had been able to accomplish, the little scale continued to multiply alarmingly, and to extend its range, until it appeared as if the orange culture in California, yielding so large an income to the State, would soon have to be abandoned.

At this juncture the thought came that the unparalleled multiplication of this pernicious scale might largely be owing to its having been brought to this country unattended by the natural enemies that may have kept it under control in its native home,

where, as was known through correspondence, it had never been recognized as a pest. It was suggested that search be made in Australia by competent entomologists for its enemies, and if found, that the attempt be made to introduce them into California. Congress was appealed to for the appropriation needed for the purpose, but perhaps deeming the project chimerical, it was not granted.

Professor C. V. Riley, chief of the entomological division of the United States Department of Agriculture, who was the first to publicly recommend the measure, and to whom the credit is largely due of conducting it, under difficulties, to its completion, was at last able, through an appropriation made for the Melbourne exposition of last year, and the kind agency of the Department of State and the Melbourne commissioners, to dispatch to Australia two of the assistants in his division, for the collection and transmission hither of the supposed native enemies of the *Icerya*. Their mission was successful. Over 12,000 specimens of parasites and other enemies were collected and sent to Los Angeles, Cal., for propagation. Among them were two species that have proved of pre-eminent service; one, a minute two-winged fly, known as *Lestophonus iceryæ*, the larvæ of which live within the body of the scale-insect; and the other, a lady-bird, *Vedalia cardinalis*, of which both the larva and the beetle prey upon the scale. Such a wonderful prolificacy has the last-named insect displayed under the fostering care given to its propagation, that of the 129 individuals imported during the past winter, from its subsequent increase there have been sent away in a single week 50,000, for distribution throughout the orange orchards of the State. Their progeny may now be estimated "by the millions," and in some localities, where earliest introduced, the trees "are swarming with them."

The success attending this undertaking, even in the brief time that has elapsed, has really been phenomenal. The orange grower now points to orchards which he was about to abandon, where "to-day it is hard to find a single living scale." Mr. W. Catton Grasby, of Adelaide, Australia, who has recently visited this country to study its methods of teaching in natural history, and who had part in the successful colonization of the scale enemies, in that he had paid, in Adelaide, one pound (\$5) a head for a large number of them, has stated to me that he had never witnessed such enthusiasm as that shown by the orange

growers in California over the result of this first attempt to fight our insect pests of foreign origin, by the importation of their natural parasites. They regard the fate of the *Icerya* as sealed, and predict that before the close of the year it will have been practically exterminated in all parts of the State where the lady-bird was early let loose upon it.

As an additional triumph for economic entomology, in winning from a high source attestation to the value of its services, I would mention that the French government has recently conferred on Professor C. V. Riley the high honor of enrollment as a Chevalier of the Legion of Honor, in consideration of his researches in applied entomology, particularly with reference to their value to French agriculture.

Returning from this digression to the notable insect events of the year :

The apple-tree tent-caterpillar, *Clisiocampa Americana*, whose abundance last year was unparalleled, again appeared in many sections of the State in immense numbers, consuming a large portion of the foliage of the orchards, and thereby greatly impairing the value of the fruit—in its diminished size, imperfect flavor, and tendency to early decay.

A remarkable multiplication of an insect such as we have only occasionally to note, was that of a species closely allied to the above, viz., the forest tent-caterpillar, *Clisiocampa sylvatica*, which occurred in Washington county, N. Y., in the early part of June. In a large hard-maple grove, in the town of Kingsbury, its depredations were seen to an extent never before witnessed by me. In a tract of perhaps ten acres in extent, on the entire north side, where the attack had evidently commenced, the trees, although some of them were two feet in diameter and seventy feet or more in height, had not a single leaf upon them; the green leaf-stalks and portions of the principal ribs alone remaining. The larger limbs, in places, were covered with masses of the caterpillars, as if, after wandering fruitlessly over the leafless trees in search of food, and without an inherited instinct for migration, their social propensities had led them to collect together for sympathy in this their time of need. They were not yet full-grown, and later, no doubt, driven by hunger, they would resume their travel and complete the defoliation of the grove, unless a fungus attack, which was observed, should spread and arrest further ravages.

The usual prevalence of the caterpillar of the white-marked tussock-moth, *Orgyia leucostigma* (Sm.-Abb.), whose operations almost annually so greatly impair the beauty of the foliage of the maple and the horse-chestnut, was not observed by me in Albany or in its vicinity or in other sections of the State visited by me, nor was it reported elsewhere in entomological journals. The conditions of the season may not have been favorable to it; but more probably, it had been subjected to serious parasitic attack the preceding year, as was certainly the case during the present year, for the conspicuous white egg-masses resting on the cocoons, indicating the development of the female and giving promise of future ravages, were of rare occurrence. In a cluster of twenty or more cocoons, not a single egg-deposit, in several instances, was to be seen. The unsightly cotton-bands that many of the citizens of Albany had placed about the trunks of their maples and suffered to remain so long that it seemed as if they were intended to do service for another year, was but labor lost, for they failed to serve their purpose. So far as my observations extended, not a single caterpillar was present on the protected trunks with the intention of surmounting the barrier.

Two instances have been brought to my notice during the year of an extraordinary multiplication of insects which have led them to depart from their accustomed habits and to intrude in large numbers in dwelling-houses, to the serious annoyance and discomfort of the household. One of these was that of the weevil known as *Otiorynchus ovatus* (Linn.), which, now, for the second year, has invaded many houses in Potsdam, N. Y., to such an extent that aid has been asked in the effort to prevent the invasion. This species had previously displayed in other localities a propensity for entering dwellings, as noticed on page 51 of my Second Report (under the name that it formerly bore of *Otiorynchus ligneus*), but never before in such remarkable numbers as reported from Potsdam.

The other instance is that of the grain-weevil, *Silvanus Surinamensis* (Linn.), overrunning a house at Catskill, N. Y., but in this case, probably the intrusion is traceable to its origin in the barn or out-buildings not far distant. More extended notice of both of these occurrences are necessarily omitted for the present.

Several other quite interesting insect attacks have come under observation during the year, the investigation of which it was intended to carry sufficiently far for presentation in this report.

This, however, has been prevented by the exactions of a continually increasing correspondence, which has already become almost burdensome; by the time devoted to the supervision of the printing of my report of last year, which had been delayed until the latter part of November; and particularly by the requirement that the present report should be presented to your board at an earlier date than usual, in readiness for printing, and without the privilege heretofore accorded, perhaps improperly, of rearrangement or the subsequent incorporation of additional matter. For these reasons, the insects noticed in this report are principally those which had come under observation in former years, and of which notes were at hand available for present use, being mainly upon those of our more common insect pests, of which inquiries had often been made of the entomologist, and answers returned either by letter or through agricultural and other journals.

In the appendix to this report will be found a list of the contributions to the department made during the year, which, it will be observed, have been somewhat more numerous than usual. Among them is one of more than ordinary value—that of Mr. Erastus Corning, Jr., embracing a number of the beautiful butterflies of South America. Mr. Corning has also donated a portion of a collection in the several orders of insects, made by him during his summer's sojourn at Murray bay, on the St. Lawrence river, Province of Quebec. Unfortunately, the larger portion of the collection was destroyed through careless handling in its transit to Albany, and the present contribution therefore embraces only the minor portion that escaped entire destruction. When arranged, proper record will be made of it.

The appendix also contains a list of the principal publications made by the entomologist—forty in number—during the year, and also those of two former years. The summary of contents with which they are accompanied, give their scope and show if they are desirable to the student for reference. The more important of these which have been communicated to agricultural papers, when rewritten and extended, will find more permanent place in subsequent reports.

With grateful acknowledgement to your honorable board for aid and courtesies extended during the year,

Respectfully submitted.

J. A. LINTNER.

NOTICES OF VARIOUS INSECTS.

Eumenes fraternus Say.

The Fraternal Potter-Wasp.

(Ord. HYMENOPTERA: Fam. EUMENIDÆ.)

Eumenes fraterna SAY: in Narrative of an Expedition to the Source of St. Peter's River, under the command of Major Stephen H. Long, ii., 1824, p. 344-346.

Examples of the cells of this insect, attached to a grapevine leaf, were sent from Sandy Hill, N. Y.

They are balls of clay of a somewhat irregular surface, of about the size of a common black cherry (six-tenths of an inch in diameter). Examination shows them to have been moulded from separate pellets of clay, of which a dozen or more are recognizable. From some of the additions little nodosities have been left projecting here and there.

One of the balls having been broken *en route*, its character is shown in a thin wall of a smooth, glassy interior surface, as if from the secretion of some glairy substance. The cavity contained no larval remains, but was nearly filled with a yellow, wasp-like pupa, having a large abdomen, constricted somewhat centrally, and much more so at its junction with the thorax.

Description.

On rearing the pupa it gave the fraternal potter-wasp, *Eumenes fraternus*, shown in the accompanying figure. It is of about the size of the common wasp, *Polistes fuscatus* Fabr. It may be recognized by its shining black color, the long petiolated basal joint of the body of about the length of the thorax, extended from its hair-like pedicel in the form of a long-necked bottle; the following joint (second) broadly pear-shaped; with a yellow spot on each side and a yellow border behind; third and fourth joints bordered with white; legs black and yellow; wings smoky.

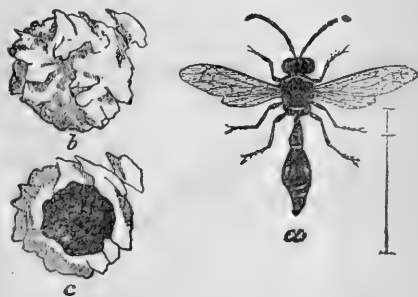


FIG. 1.—The fraternal potter-wasp, *EUMENES FRATERNUS*, and its cell.

Distribution.

It is quite a common species throughout the Eastern United States. It extends from Canada to Texas, and in its broad range is subject to so great variation that several varieties might be made.

Architecture.

The cells of this wasp, as above described, are to be met with "joined to the upper surface of leaves, or stuck to little branches, or fastened against a wall" (H. de Saussure, in *Synopsis of American Wasps*). Dr. Packard states that they are attached by a short, stout pedicel to bushes; but, according to de Saussure, the cell terminates in a little bell-mouthed neck, which it obliterates after filling. According to Say, the insect constructs for each of its eggs a hollow globe of earth, with a short ascending neck, the rim of which is sometimes widely outspread horizontally. In the examples before me, fastened to the *under* surface of the leaf, one shows the pedicel-like bell-shaped mouth in place, but closed, while the two others show a fracture where the mouth would have been.

Habits.

The provident mother wasp of this species packs the cell to which she consigns her egg with insect food to serve her young until it shall reach its pupal state, when it no longer requires nourishment. Dr. Harris tells us that eighteen or twenty canker-worms are sometimes imprisoned in a cell. It is not, however, confined to this particular caterpillar for food, for other nocturnal lepidoptera have been found within cells that have been opened; and the young larvæ of butterflies have also been seen in possession of the wasp, destined, no doubt, to serve for larval food, as the wasp itself is not carnivorous. At *c* in Figure 1, the interior of a cell is shown packed to its utmost capacity with young canker-worms which had previously been reduced to a stupified and helpless condition, by an amount of poison injected into them in quantity sufficient barely to permit of a continuance of life and prevent decomposition.

Transformation.

About a month is required for the development from the deposit of the egg to the perfect insect, when the thin wall of the cell is easily broken by the wasp for its escape. Examples of the species have been taken by me in various localities in the State of New York from the latter part of July to beyond the middle of August.

Family Characters.

The family of *Eumenidæ*, to which this species belongs, contains those of the true wasps, having their wings folded horizontally, which are solitary in their habits, consisting only of males and females; unlike the neighboring *Vespidæ*, which are composed of males, females, and neuters. Some of them, as in the genus *Odynerus*, in constructing their nests, excavate with their powerful mandibles in sandy banks, in crevices in stone walls, in holes bored in wood by other insects — unlike *Eumenes*, which builds its mud nests in the open air.

Hypoderma bovis (De Geer).*The Ox Warble-Fly.*

(Ord. DIPTERA: Fam. ESTRIDÆ)

Æstrus bovis LINNÆUS: Systema Naturæ, 12th edit., ii, 1767, p. 969, No. 1.

In reply to an inquiry received from Watertown, Jefferson county, N. Y., for information regarding the above-named fly, and for the best method for preventing the deposit of its eggs, the following communication was made to the *Country Gentleman*, and published in the issue of June 23, 1887. Since that time, the valuable studies of Miss Ormerod, of England, on this species, particularly in the direction, of late, of the enormous losses resulting from its prevalence, has aroused interest in this country, and important observations have been made upon it. These will not be referred to at the present, as it is understood that the Entomological Division of the Department of Agriculture at Washington, will soon publish the results of their careful and extended investigations of the insect, in which they have been for some time engaged.

Warbles are small tumors occurring in the skin of the back of some animals, caused by the presence and operations of a species of fly in its larval stage, contained within them.

Of these warbles or wurmals (probably derived from worm-holes), several different ones are known, as that of the buffalo, produced by *Hypoderma bonassi* Brauer; of the ox, by *Hypoderma bovis* DeGeer; another species believed to belong to the ox or the sheep, *Hypoderma lineata* Villers; of the reindeer, by *Edemagena tarandi* (Linn.); and an unnamed species, the larvæ of which were taken from under the skin of the neck of a box turtle, *Cistudo Carolina*, in Massachusetts (*American Naturalist*, 1882, xvi, p. 598, larva figured).

The ox warble-fly, *H. bovis*, is found in both North America and Europe, and is a quite common species. When a large number of the

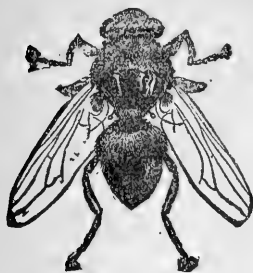


FIG. 2.—The ox warble-fly, *HYPODERMA BOVIS*, enlarged.

warbles occur in a single animal, its health and condition are seriously impaired, and the value of its hide for conversion into leather greatly depreciated.



FIG. 3.—The ox warble-fly, natural size.

As very few persons are familiar with the appearance of the fly, or would be able to recognize it, although it might be hovering with evil intent about their cattle, figures of it are herewith presented, accompanied with such description as will enable any one to identify it beyond all doubt whenever it may be encountered. Figure 2 (after Verrill) represents the fly, enlarged, and Figure 3 (after Ormerod) in its natural size.

Description of the Fly.

It will be seen that it measures a little more than half an inch in length. It is heavily covered with hair, except the thorax, which is partially naked, black, and twice broadly banded with white and yellow. The abdomen is also black with a white or yellowish band at its base, a black band over its middle, and a reddish-orange band of hairs at its tip. The head is large, and its front is ash-colored with yellowish-white hairs. The wings have a brown tinge, and are unspotted. The legs are black, with lighter feet. Some writers have compared the fly, in appearance, with a humble bee, its general shape and the yellowish hairs of its body being the points of resemblance.

Life-history.

It has not yet been ascertained how the egg is deposited by the fly, whether simply attached to the skin, or if inserted into it by means of its long, extensile ovipositor, which has been described as gimlet-like. Nearly all the subsequent life-history of the insect has been fully worked out, and for much of our later knowledge of it we are indebted to the earnest and successful labors during the past two years of Miss Eleanor A. Ormerod, Consulting Entomologist of the Royal Agricultural Society of England. The following items in its life-history have been mainly drawn from an illustrated paper on "Warbles," by Miss Ormerod, published in the *Mark Lane Express*, of April 25, 1887:

Evidence of the attack, if the skin be removed, may be discovered on its inner or flesh side early in the winter. Within a small swelling at the lower portion of the hide, the larval insect—"maggot," as it is usually called—very small in size and of a blood-red color, may be discovered lying free at the bottom of a fine channel, shown in Fig. 4, leading down to it, but not traceable to the outer surface. * The small swellings develop into "warbles," which are formed with the growth of the larva as early as in February, occasionally in January, and may be found at this time with an open passage leading outwardly on the hide. The larva is white and worm-like in form and appearance. In its next stage of development it is club-shaped, and in its following stage it assumes its well-known shape, with its thick and prickly skin, lying within the warble cell with its membranous walls.*

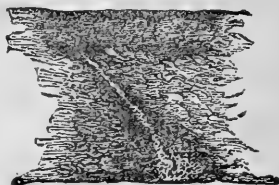


FIG. 4.—Channel made by the warble larva through the hide, much enlarged. (After Ormerod.)

Some very interesting changes take place in the pair of spiracles or breathing-pores in which the abdomen of the larva terminates, in that

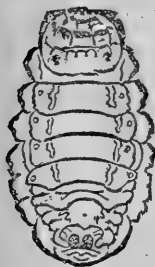


FIG. 5.—The larva enlarged. (After Verrill.)

while in their early stage they are elongated and somewhat club-shaped, horny, and adapted to the boring service that they have to render, later they become flat and kidney-shaped disks which undergo two or three subsequent modifications before they attain their final phase.

The larva, at maturity, is shown in Figures 5 and 6. We prefer to call it by its scientific designation, which should be understood by all, rather than by the repulsive name (from association) of "maggot," although the latter properly belongs, in common usage, to the larva of a fly, as that of "grub" does to the corresponding stage of a beetle.

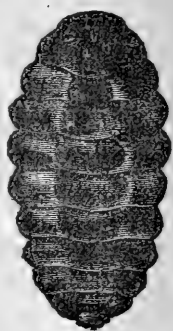


FIG. 6.—The larva enlarged. (After Ormerod.)

At its full growth it is about an inch in length, oval, somewhat flattened, and varying in color from whitish to dark gray. It shows a number of deeply incised segments (ten can easily be distinguished) and many rings of minute spines or prickles, which aid materially the

*For a valuable paper on the larva of this and other species of the family, see a translation from Friedrich Brauer's "Monographie der cestriden," Wien, 1863, contained in *Psyche*, iv, 1885, pp. 305-310.

muscular coating in extrication from the warble and burying for pupation, it being unprovided with feet.

Figure 7 represents a section of the terminal tip of the larva during its boring period, with its pair of spiracles communicating with the two tracheal tubes which traverse the larva, and are seen to be tied together near their origin by a cross-connecting tube.

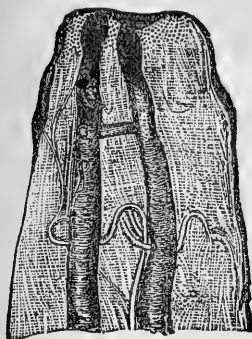


FIG. 7.—The larval breathing-tubes. (After Ormerod.)

The larvæ commence to mature (their development not being uniform) during the month of May, when they crowd themselves out through the hole in the warble, fall to the ground and bury themselves for pupation. The pupal period is of about four weeks' duration, at the expiration of which the fly emerges and makes its appearance abroad, in readiness to deposit its eggs for another brood.

Preventives and Remedies.

From the unequal development of the warble above referred to, the flies continue to appear abroad for quite a long period, viz., during the months of June, July, and August. If preventives of the attack of the fly are to be employed, it will be necessary to apply them from time to time throughout the above-named months.

Of preventives, the following may be mentioned: Dry sulphur rubbed in on the back is recommended. Dressing the back with the McDougall sheep-dip (sold by many druggists in our large cities, and advertised in our agricultural journals by the American agents, F. Porter Thayer & Sons, 104 Chambers street, New York) has proved quite efficient, as has been extensively tested in England. But perhaps a still better preventive may be prepared by mixing one quart of whale-oil soap, one gill of oil of tar, and four ounces of flour of sulphur. Its application is to be made with a brush on both sides of the spine of the animal, once a week during the period of the egg-laying of the fly—June, July, and August, as before stated.

But beyond all question the best (from its being the most simple and the most practicable) method of dealing with the warble insect, is to kill the larva. The efficacy of this method will appear from these facts: The fly seldom wanders to any distance for oviposition, but almost entirely confines its range to the farm where it had its birth; and experience has shown that when careful examination of the cattle

has been made, and the larvæ within the warbles killed, there was nearly an entire exemption from attack the following years.

The warbles are easily to be found during the months of March and April, by passing the hand over the back of the animal on each side of its spine, when, if any are present, they will at once be detected. On examination, an opening will be seen leading into the warble, and closely applied to it, the black-tipped tail of the larva within may be discovered, drawing in the air needed for its sustenance.

The old method has been to postpone all attention to the warbles until the month of May, when their contents can easily be forced out by a gentle pressure with the fingers. But this delay, from the greater irritation produced by the rapid increase in the larval growth, entails much increased suffering upon the infested animal, and consequent detriment to its health and condition.

Careful examination of the stock should be made as early as in February, when opened warbles may often be discovered. As soon as they are found in this stage of advancement, a small quantity of mercurial ointment should be applied to the opening, with such pressure as shall cause it to reach the end of the larva lying against the hole. The larva will be killed by the ointment, and its decomposed material discharged in two or three days thereafter, and the healing of the warble will immediately follow.

It has been stated that if, whenever the presence of warbles can be detected, whether in the autumn or during the winter, mercurial ointment be rubbed upon them, it will be absorbed through the skin, and cause the death of the larva within. Kerosene is said to have the same effect; but we can not vouch for the efficacy of these methods of treatment.

Instead of the above ointment, almost any thick, sticky, greasy matter, such as rancid butter, lard, or cart grease, applied to the warble in such a manner as completely to close the opening, will kill the grub, as its life can only be sustained by the air which it draws through the hole into the breathing pores at the tip of its abdomen. A bit of tar has been successfully used for the purpose.

The Ox Gad-Fly.

Another species of fly infesting the ox, which in the minds of many persons is confounded with the warble-fly, although of very different habits, is the ox gad-fly, *Tabanus bovinus* Linn., represented, after Ormerod, in Figures 7 and 8. This species is mentally associated with a galloping herd of cattle with their tails in mid-air and mouths wide-spread in bellowing, rushing madly over their pastures to find relief in a plunge in water, as has been so often

pictured in English works and in writings drawn from English



FIG. 8.—The ox gad-fly, *TABANUS BOVINUS*.

Tabanus bovinus, fortunately, has not been introduced among us. The species of this family popularly known as "horse-flies" are injurious through the severe bite that the fly inflicts preparatory to, and during the operation of, her blood-sucking. Only the females rest.

bite and feed on blood. The larval stage, in many cases, is passed in the ground.

sources. As much of our knowledge of natural history, not many years ago, was drawn from the above sources, it is not uncommonly believed that we have the same gad-fly in our country; but while there are many species of the *Tabanidæ* which are at times exceedingly annoying to our domestic animals and to ourselves, the *Taba-*



FIG. 9.—The ox gad-fly at

Drosophila sp.

A Flour-paste Fly.

(Ord. DIPTERA: Fam. DROSOPHILIDÆ.)

I send you by mail a package containing larvæ of a little fly, very troublesome around my cellar and pantry. These were taken from some paste that had been set aside for a short time. I could not obtain any of the flies, but presume that they will be produced from the larvæ if they reach you in good condition. They are very partial to anything in a state of fermentation, and if my pickled fruit or jam begins to sour, they find the change in it before I do, and frequently in a short time the entire top of the fruit seems alive with the larvæ, although they never penetrate deeply into the jar. Please tell me the name of the insect, its habits, and history. O., *Susquehanna, Pa.*

The flies have been bred from the larvæ, sent in the paste, and they appear to be a species of *Drosophila*, of which several species are known to be attracted by the odor of fermenting substances. The particular species of this minute fly is unknown to me. The pupa-case is one-tenth of an inch in length, and the perfect insect has a spread of wings of about one-eighth of an inch. Its large thorax and small abdomen are of a dull yellowish color, and under a lens, show a number of long, stout hairs; the wings are beautifully iridescent. These flies are so very small, that they would hardly be noticed in the dim light of pantries and cellars. They are not of the same species with those mentioned above as infesting pickled fruit and jam when commencing to ferment. The latter, if they could

be examined, would probably prove to be identical with the species which has bred, by me, from jars of pickled plums—the *Drosophila ampelophila*, or “the pickled-fruit fly,” for a notice of which, and in further reply to the above inquiries, see the *First Report on the Insects of New York*, 1882, pp. 216–221.

Adalia bipunctata (Linn.).

The Two-spotted Lady-Bird.

(Ord. COLEOPTERA: Fam. COCCINELLIDÆ.)

Coccinella bipunctata LINNÆUS: Syst. Nat., edit. 10, 1758, p. 364, No. 2.

The communication given below is but one of many received which indicate a great need of such additional knowledge of our most common lady-bugs, as shall prevent their being mistaken for the carpet-beetle and sharing the fate justly meted out to that destructive household pest.

I inclose in this a small box containing two specimens of a beetle that has been found in large numbers in many of the dwellings of this city. Those who have suffered from the ravages of the carpet-bug state with great positiveness that the insect inclosed is the beetle from which comes the larva that has been so destructive to carpets, and it appears to be a fact that where great injury has been sustained by the carpet-bug, there these beetles have been found in the greatest abundance. I do not find that the specimens inclosed answer to the descriptions of the carpet-beetle that have been published in the newspapers. Most persons would say that the beetles I send are lady-bugs, and I find the very same insect on plants out of doors. One characteristic of these beetles is, a very disagreeable odor evolved when they are handled or disturbed, and if in numbers the stench is intolerable. Does this peculiarity belong to lady-bugs? Written notices of the carpet-beetle state that in the warm days of March and April, the animals are found in numbers on the windows—such has been the case this spring in houses here. What we term lady-bugs were found crawling in the vicinity of the windows. Can you tell me if the carpet-bug and the lady-bug are identical? H. L. Y., *Poughkeepsie, N. Y.*

The beetles received are the *Adalia bipunctata* (Linn.), one of the “lady-birds.” It is a small beetle, of a broadly oval form, having the wing-covers of a dull red color, each one conspicuously marked with a single black spot on its center; the thorax is of a cream color, with an inverted W-shaped black mark; it is shown in Figure 10. So far from being connected with the destructive carpet-bug, it is one of our insect friends, as are, with perhaps two or three exceptions, all of its associated “lady-bugs.”



FIG. 10.—The two-spotted lady-bird, *ADALIA BIPUNCTATA*. (After Emmons.)

Food of the Insect.

This species is one of the most useful of its family—the *Coccinellidae*—as it is of broad distribution throughout the United States, and occurs on almost any kind of vegetation where plant-lice abound. In its larval stage it is wholly carnivorous, its food consisting to a great extent of plant-lice. In its imago or beetle stage, while largely carnivorous, it is undoubtedly vegetarian in part, as examinations of the stomachs of allied species of *Hippodamia* and *Coccinella* have shown them to be—in some instances their food having been ascertained to consist of from fifty to seventy-five per cent of pollen of *Compositæ* and other plants, and spores of lichens and fungi.*

Its Domestic Habits.

The two-spotted lady-bird passes the winter as a perfect insect, and has the habit belonging to several insects, as notably that of the elm-tree-beetle, *Galeruca xanthomelæna*, of *Otiorhynchus ovatus* (one of the *Curculionidae*), and of *Chloropisca prolifica*,† of entering dwelling-houses for the purpose of hibernation; but of all the many species of the lady-bugs, of which 141 are recorded in the Henshaw list, this is the only one that possesses this domestic habit. During the winter of 1886-7, following its unusual multiplication as the result of the presence of an unprecedented number of plant-lice in hop-yards and on other crops in the State of New York, it became remarkably abundant in many dwellings.‡

Mistaken for the Carpet-beetle.

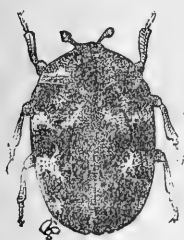


FIG. 11.—The Carpet-beetle, *ANTHRENUS SCROPHULARIÆ*.

When, at the advent of the first warm days of spring, it resumed its activity, it was in many instances believed to be the greatly dreaded carpet-beetle. From many localities in the State examples were sent to me, asking if it was that insect, while in some instances reported to me, it was not thought worth while to make the inquiry, but the harmless creatures were ruthlessly gathered upon dust pans and thrown into the fire. It would hardly seem possible, after all that has been written and published of the lady-bugs and of the carpet-beetle (pictures of the latter have been scattered broadcast over the land

* Forbes: In *Bulletin No. 6 of Illinois St. Lab. of Nat. Hist.*, Jan. 1883, pp. 51-55.

† *Fourth Report on the Insects of New York*, 1888, pp. 67-72.

‡ A gentleman in Boston, Mass., has reported it as a common insect in his house during the winter months, for successive winters. There had seldom been more than two or three days at a time when these lady-bugs had not been seen creeping or flying about the house, invariably coming out and showing activity in his library every evening as soon as the room became warm. At one time during cold weather at least 1,000, as estimated, were on the inside of his front door. (*Insect Life*, i. 1888, p. 56.)

in newspapers), that so criminal a blunder could be made. There is no resemblance between the two in ornamentation (see figure of the carpet-beetle herewith presented), while in size the lady-bug is perhaps eight times the larger in surface.

It is hardly necessary to add to the above that the *Adaha* is entirely harmless in its visits within doors, not feeding in the slightest degree upon woolens, cottons or silks or other fabrics.

Odor of the Beetle.

Its peculiar odor, referred to in the communication from Poughkeepsie, has long been known. It is caused by a yellowish viscid substance, which is thrown out from the joints of the legs, when the insect is taken in the hand, as in the oil-beetles and blister-beetles of *Meloe*, *Cantharis*, etc., of another family. This secretion, at a time when many insects were employed in medicine, was supposed to possess medicinal properties, and the beetle was recommended, and we believe, used for relief from tooth-ache by crushing its body and placing a portion in the cavity of a decayed tooth.

Dermestes lardarius Linn.

The Bacon Beetle.

(Ord. COLEOPTERA: Fam. DERMESTIDÆ.)

Dermestes lardarius LINNÆUS: Faun. Suec., 1st edit., 1746, p. 135, 360; 2d edit., 1761, p. 140, 408.

This common household pest is frequently received for name, with inquiry of its habits and a remedy for its attack. The following is one of the notes of inquiry received:

Inclosed you will find several bugs and larvæ which I found destroying our bacon. Will you please tell me what they are, and if there is any way of preventing their ravages? Our meat was mostly put in heavy meat sacks; some was in muslin lined with paper, and a few pieces were without either. The meat was encased in sacks about the first of March, and hung up in the garret. The sides were free from them although without sacks. If there is a remedy, please let us have it.

The insects sent with the above are "the larder-beetle," or as more generally designated, from its particular fondness for bacon, "the bacon-beetle." They present the following appearance, which is so marked that they may be easily identified:

Description of the Beetle and its Larva.

The beetle is of an oblong-oval form, black, except the basal-half of its wing-covers, which are of a pale buff or brownish-yellow color, within which, on each cover, are (usually) three elongate black spots in an irregular transverse row. The legs are short and the head is bent downward and mostly concealed by the broad thorax. In length it measures three-tenths of an inch. It is shown at *c* in the accompanying figure. The larva which produces the beetle, represented at *a* in the figure, is about a half-inch in length when full-grown, dark-brown above, whitish below, rather thickly covered with brown hairs as long or longer than the greatest breadth of its body; these hairs, when magnified, present a peculiar biserrated appearance, as shown at *b*.

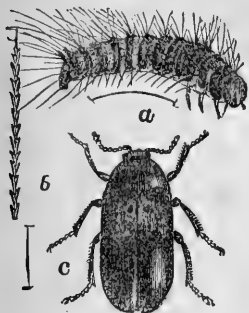


FIG. 12.—The bacon-beetle, *DERMESTES LARDARIUS*; *a*, the larva, enlarged; *b*, a larval bristle, greatly enlarged; *c*, the beetle.

Introduced from Europe.

The *Dermestes lardarius* was introduced from Europe, where it has been known for over two centuries, many years ago, and is now quite generally distributed over our country. It has become thoroughly naturalized, and is, we should judge from the accounts received, committing greater injuries here than in its old home. Associated with it, and of similar origin, are several other destructive in-door pests, as *Dermestes vulpinus* (figured on page 89 of our Fourth Report), which at one time committed such ravages in the furs of the Hudson's Bay Company in its store-houses in London that a reward of £20,000 was offered for the discovery of a means for effectually destroying it; *Anthrenus scrophulariæ*, the notorious carpet-beetle; *Anthrenus varius*, the pest of insect and other animal collections in natural history; *Attagenus megatoma*, also a carpet-beetle, etc., etc.

Its Food.

Dermestes lardarius is particularly fond, as above stated, of bacon, although it also preys upon other dried meats, as hams, etc., also on cheese, peltry, skins, horns and hoofs of dead animals, feathers, insects in museums, and mounted birds and mammals. Recently it has been discovered as displaying a fondness for beeswax, as will be hereafter noticed. It does not eat clothing of any kind, unless it incloses, or is heavily charged with, fatty animal matter.*

* Mr. Henshaw's statement that wool and silk are among its articles of food, may be presumed to refer to the unmanufactured material.

It is the larva that commits by far the greater depredations, the perfect insect being comparatively harmless, except as it continues the species by the deposit of its eggs. In one instance, however, I have known it to attack and destroy some insects while exposed on the preparing boards.

Its Attack on Bacon.

In the instance in which inquiry is made, where the larvæ were found in bacon hanging in a garret in paper and muslin sacks, the attack may have originated in the deposit of eggs before the meat was sacked, or subsequently through some break or opening in the sacks. In the former case, the larva sent must have been of the second brood, for the time required for the eggs to develop into beetles would not exceed six weeks. The only definite knowledge that we appear to have, in the literature at my command, of the length of time required for any of its stages, is the statement of Dr. Horn,* that "the insect remains in its pupa for a period varying from three to four days to a week or even more, depending principally on the warmth of the locality."

Difficulty of Preventing Attack.

No way is known of preventing attack when meat is exposed where the insect occurs. The only security would seem to be in bagging while free from egg-deposit, in such a manner that the meat shall be protected in bags of such a character or so treated that the young larvæ would not penetrate them to reach their food. Would not this be secured by a thick coating of lime-wash?

It is, therefore, quite important that the appearance of the beetle and of its larva should be known, so that they may be looked for and killed whenever discovered, and their ordinary rapid multiplication by this means prevented. The cast larval skins (exuviae) which are thrown off from time to time during growth, often disclose the lurking places of the active larvæ, buried within the substance on which they are preying. There are apparently several broods throughout the year, so that meat is liable to attack at any time.

It has been stated recently that when the insect is known to occur in a house, they may be attracted by baits of old cheese, from which they may be gathered and destroyed.

**Proceedings of the Entomological Society of Philadelphia*, i, 1861, p. 28.

Unusual Abundance of the Insect.

The following note from a correspondent at Ridgefield, Conn., shows the multiplication of the beetle to such an extent that relief from its annoyance could only be obtained through persistently collecting and destroying every individual that came under observation:

Will you please tell me what kind of a bug this is that I inclose. I find it wherever I leave any food for a few hours. I also find them in the soiled-clothes basket and in the bureau drawers, where I had put some handkerchiefs partly used. Do they eat clothes, or are they simply scavengers for the clearance up of scraps? What will prevent these bugs from getting into a store basket where groceries for family use are kept?

The Insect as a Wax-feeder.

A beetle sent to me for name, by Mr. John Aspinwall, editor of the *Bee-Keepers' Magazine*, the larvæ of which had attacked some empty honey-comb and riddled the wax, proved to be this species. In the reply made by me, published in the *Bee-Keepers' Magazine* for May, 1888, it was stated: "I have no knowledge of this insect ever attacking honey-comb, nor do I find any reference to such a habit in any publication at hand. Professor Cook has not included it in his list of enemies of the bee, given in his excellent *Manual of the Apiary*. If the suspicions entertained of the larvæ feeding on comb shall be verified, it will be an interesting fact, as indicating a strange extension in its food-habits."

Inquiry was subsequently made of Professor Cook of any knowledge that he might have of the occurrence of *D. lardarius* in bee-hives, to which he made reply that in the last edition of his *Manual* [not seen by me when above quoted] he has stated that it often feeds on the dead bees and pollen in comb, and so mutilates the fabric.

Inquiry was also made of Dr. Hagen, of the Museum of Comparative Zoölogy, at Cambridge, Mass., if, in the large library of European entomological literature at his command, there was any record of *D. lardarius* feeding on wax or infesting hives in Europe, or if he had knowledge of such occurrence elsewhere. He returned answer that in an extended search through a large number of works, both in the Museum library and in the public library of Boston, he has met with no record of the kind. Mrs. Hagen had recalled the fact that yellow wax was sometimes injured in Europe by insects.

Subsequently to the above correspondence, confirmation was found of the wax-eating of this insect as above reported, in a brief article contained in the *American Entomologist* for June, 1870, vol. ii, p. 246.

previously overlooked by me. The editor, Professor C. V. Riley, in reply to a correspondent from Wisconsin, who had sent examples of the larvæ to him for identification, after giving its name, states: "We never knew them before to occur in bee-hives; but as they feed on feathers, horn, hoof and other (to us) indigestible substances, it is not surprising that they should also relish wax. Those you sent fed ravenously upon it; and after changing their coats several times, became beetles."

The present instance brought to notice by Mr. Aspinwall of *D. lardarius* feeding on wax, is an interesting addition to our knowledge of the insect, for we are now authorized to conclude that the first reported case above quoted, was not, as may have been thought, simply an abnormal manifestation of appetite, but that a larval taste for wax exists which will be gratified whenever the opportunity for so doing offers.

More recently Miss H. A. Heaton, of Charlton, N. Y., in a letter written to the editor of the *Bee-Keeper's Magazine*, under date of September 22, 1888, has related her experience with *D. lardarius* as a honey-comb pest. It is as follows:

I was much interested in the information given in the May Magazine with regard to the bacon beetle attacking comb. For several years I have been troubled with the larvæ of this beetle working in combs used for extracting, but as the combs were used each summer the larvæ were never permitted to injure them greatly. The combs were kept in a shop formerly occupied by a carpenter, and were always put away in the autumn nicely cleaned by the bees of all adhering honey, and with very few, if any dead bees in the cells. When getting them for use the next summer I would strike each frame on the floor and jar the beetles and larvæ out of the comb. No meat of any kind was kept in the building, and they certainly seemed to thrive on their food — wax or pollen — for they were large and healthy larvæ.

***Agrilus ruficollis* (Fabr.).**

The Raspberry Gouty-gall Beetle.

(Ord. COLEOPTERA : Fam. BUPRESTIDÆ.)

Buprestis ruficollis FABRICIUS : Mantissa Insectorum, i, 1787, p. 184, No. 85.

To an inquiry from St. Joseph's, Mich., of the stage in which the insect that causes the irregular swellings on the raspberry canes passes the winter, and for such other information as would aid in arresting its injuries, the following reply was made:

This particular deformation of the raspberry cane is known as the raspberry gouty-gall. Its architect lives through the winter. It is the larva of one of the *Buprestidae* beetles, which was described by Fabricius a century ago, under the specific name of *ruficollis*, referring to the coppery-red color of its thorax. It is now known as *Agrius ruficollis* (Fabr.). From the history of its transformations as traced by Prof. Riley, we learn that the eggs of the beetle are deposited in the growing canes of the raspberry and blackberry during the months of July or August. The larvæ which soon hatch therefrom pass into the sap-wood and burrow through it in an obliquely transverse direction, producing the irregular swellings during the period of the flow of the sap, shown in the figure, and eventually killing the cane, through girdling it, especially when several larvæ unite in their operations within one of these elongated galls. The larvæ are often killed in northerly latitudes by the winter's cold, but if they survive, early in the spring—April or May—when they have nearly attained their growth, they penetrate into the

FIG. 13.—The raspberry gouty-gall of *AGRIUS RUFICOLLIS*. (After Riley.)

pith, where they undergo their pupal transformation, and the perfect beetles emerge during June and July, to couple and deposit the eggs for another brood.

Remedy.

The above knowledge of the history of this pest places within our hands an easy method of controlling its injuries. It is only necessary to make thorough search for the gouty canes during the winter and early spring, and to cut them out and burn them; and to the extent that this work is done, to the same extent will future depredations be prevented.

Distribution.

This insect seems not to prove very injurious in the northern portion of the United States. Although included in the entomological reports of Canada, it does not definitely appear that it occurs there. I have taken it rarely in the State of New York. The examples in my collection bear date of capture of July thirtieth.

Literature.

For additional information of the insect, some of the following publications may be referred to:

- Amer. Quart. Journ. Agricul.-Sci., iv, 1846, p. 300 (description and figure of beetle),
 Report U. S. Dept. Agriculture for 1868, p. 92 (figure, and habits of allied species); ib., for 1870, p. 67 (figures, etc.).
 American Entomologist, ii, 1870, pp. 103, 128, figs. 68, 69, 90 (transformations); ib., iii, 1880, pp. 91-92, figs. 27, 28.
 Ann. Report Entomolog. Soc. Ontario, for 1873, p. 8 (figure, etc.).
 Sixth Report Insects of Illinois, 1877, p. 114 (description of larva and beetle).
 Insects Injurious to Fruits.—Saunders, 1883, pp. 307, 308, figs. 316-318.

Coptocycla aurichalcea (Fabr.).

The Golden Tortoise-Beetle.

(Ord. COLEOPTERA: Fam. CHRYSOMELIDÆ.)

Cassida aurichalcea FABRICIUS: Syst. Eleuth., i. 1801, p. 397, No. 53.

Inclosed please find some little golden beetles which are found on sweet potato vines. They are so destructive that plaster has been dusted over the vines to drive them away. They appear to be *Chrysomelidæ*, but I have been unable to identify them.

The beetle, of which the above inquiry is made by a correspondent from Philadelphia, Pa., belongs to the *Chrysomelidæ*, and is at present known by the common and scientific names above given. When alive, their brilliant coloring, like a piece of gold leaf, makes them one of our most beautiful insects. Its brilliancy varies greatly with its emotions, it is thought, and disappears with its death. They are, however, very injurious to the sweet potato vine, which is their favorite food-plant; they also occur on the bitter-sweet, morning-glory, and different species of *Convolvulus*. The eggs are laid singly on the leaves of the larval food-plant, and are somewhat unusual in form, being angular and flattened, with some spinous appendages.

The Larva.

The larva is a peculiar looking creature. It is broadly oval, rather flat, about one-fourth of an inch long when full-grown, its body is dark brown with a paler shade on the back, margined with a range of stiff branching spines, and terminating in a long forked tail,

which it utilizes by bending it over its back and supporting upon it a protective covering or mantle composed of its excrementa and exuvie, to shield it from the sun or to hide it from its enemies.

Excellent illustrations of the larva and beetle are given in the *American Entomologist* i, 1869, p. 237, figs. 177, 178.

The beetle was observed in abundance on the morning-glory, at Kaatskill Bay, on Lake George, N. Y., on the twenty-sixth of June — many in copulation, and in great resplendence.

The Clubbed Tortoise-Beetle.

Coptocycla clavata (Fabr.).

(Ord. COLEOPTERA: Fam. CHRYSOMELIDÆ.)

Cassida clavata FABRICIUS: Supp. Syst. Ent. 1798, p. 83, No. 30-1.

Can you give me any information concerning the inclosed curious-looking insects, which appear to be quite new in this locality? I have found them in isolated cases feeding upon the leaves of the potato, egg-plant, and tomato during this season and last. F. T.

MORRISTOWN, N. J.

The curious-looking insects (received in small fragments from unprotected inclosure in a letter) belong to the group of tortoise-beetles and to the species at present known as *Coptocycla clavata*. By some authors it is placed in the genus *Deloyala* Chevr., and by older authors was included in the genus *Cassida*.

The beetle, shown in Figure 14, is less than one-fourth of an inch long, of a broadly oval and flattened form, and with the thorax and wing-

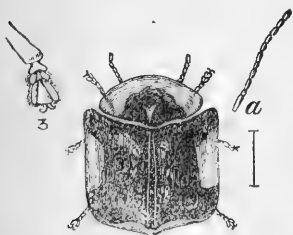


FIG. 14.—The clubbed tortoise-beetle, *COPTOCYCLA CLAVATA*. (After Emmons.)

covers thinly spread out on their margins — their upper portions pitted and rough, of a brown color, marked with black on the more elevated parts. The upturned margin of the thorax is whitish and transparent, as are also the margins of the wing-covers, except at four points where the brown of the dorsum extends to the margin, viz., at the apex and just before the posterior tip. This species is not known to be particularly injurious to the potato plant, although it has at times been found in considerable numbers upon it in different localities, as at Old Westbury, Long Island, N. Y., but was not reported as doing serious damage. In addition to the tomato and egg-plant, as above stated, it also occurs upon the bittersweet (*Solanum dulcamara*). It is somewhat singular that this species does

not, so far as known, attack the sweet-potato and the morning-glory, both of which are quite attractive to the other species of this genus, *Coptocycla aurichalcea* (Fabr.), and *C. guttata* (Oliv.); and also to *Cassida nigripes* Oliv., and *Cassida bivittata* Say.

Both the larvæ and the perfect insects of the tortoise-beetles feed upon the plants on which they are found.

The larval *Coptocycla clavata* possesses the same habit with its congener, *C. aurichalcea*, of concealing or protecting itself beneath an excremental covering borne on the flexible anal horns over its back.

The early stages of this species have not, so far as we know, been described or observed, owing, probably, to its comparative rarity, or to its not possessing special economic importance.

Bruchus scutellaris Fabr.

A Pea-Weevil.

(Ord. COLEOPTERA: Fam. BRUCHIDÆ.)

Bruchus scutellaris FABRICIUS: Entomologia Systematica, Tome I, Pars ii, 1792, p. 372, 14.

I send you to-day some specimens of a pea-weevil that seems to differ considerably from the common pea-weevil, *Bruchus pisi*. Last year I raised a crop of the Southern black-fallow pea. This spring the larger part was used for seed, and no weevils or holes in the peas were observed. About three bushels were put into a bag of loose, open texture, remaining in it all summer. A few days ago [latter part of November] the bag was covered with weevils, and upon examining the peas they were found to be hot,* pierced with holes and alive with the little beetles. Is this a true pea-weevil, or a kind that attack peas in the granary? G. C.

BRUCKNER'S STATION, VA.

Description of the Weevil.

The weevil is quite different in general appearance, when closely examined, from the well-known "pea-bug," *Bruchus pisi* Linn., and is hardly more than one-half the size, for while that species measures 0.20 inch in length, this is only from 0.12 to 0.16 inch. Its principal colorational features are these: The wing-covers (elytra) are brownish or ferruginous, black at the tip and with a large black spot resting on the outer margin at the middle and reaching nearly to the inner margin—the two connected with black along the outer margin and

* See notice by Mr. L. O. Howard, in *Insect Life*, i, 1888, p. 59, on "Heat evolved from the work of a *Bruchus*" [*scutellaris*—overlooked until the proof-reading of the above.

with white scales between them. The end of the abdomen (pygidium) has a whitish line along its middle and a large dark-brown spot on each side thereof.

It may be separated structurally from *B. pisi* from its belonging to a group of seven described United States species, as indicated by Dr. Horn in his "Revision of the Bruchidæ of the United States," in which the hind thigh (femur) is toothed on both the inner and outer sides, while the *B. pisi* and *B. rufimanus* group is characterized by a femoral tooth on the outer side only.

Its Literature.

The original description of the species was by Fabricius in his *Entomologia Systematica*, as above cited. A detailed description of it may be found in Dr. Horn's Revision above cited, in the *Transactions of the American Entomological Society*, iv, 1873, p. 317. It was originally described as an European species, but with a number of others of the *Bruchidæ*, it has been introduced through commerce into the United States, and into most of the civilized countries of the globe. At the Centennial Exhibition, at Philadelphia, it was discovered by Drs. LeConte and Horn in beans received from Venezuela, S. A., as appears in their "Report on Insects introduced by means of the International Exhibition."

Its Probable Life-history.

The life-history and habits of this pea-weevil would be about the same as those of the common species, *Bruchus pisi*; its eggs, like that, being deposited on the newly formed pod, and the young larvæ when hatched penetrating the pod and entering into the young peas, to feed therein and to mature after the gathering of the crop. The pea-bug does not deposit its eggs on ripened and dried peas in granaries, nor could its larva penetrate their tough rind and burrow into the hard, dry substance. The statement made by our correspondent is a strange one, and we can not offer a satisfactory explanation of it. The bugs should, in accordance with the habits of their kind, have emerged from the peas in the spring of the year following the crop. They often appear before the time of planting, but not always so if kept in a cold place and planted early; and therefore, if these were the attendant conditions it might be expected that the three bushels that were bagged would give no evidence, at the time, of their being infested, particularly if such attack was not expected and no careful examination of condition made. But that, passing their ordinary time for emerging, they should make their escape and show themselves on the outside of the bag (of an "open texture" permitting their

escape) during the month of November (the living specimens were received about the middle of that month) seems to me quite remarkable. When the appearance of an imago that ordinarily requires a winter for its development, is delayed beyond its normal time in the following spring, as is not unfrequently the case with beetles, moths, etc., it is usually extended to the spring of the year thereafter, when the growing plant is in readiness for oviposition and for larval food. Such prolongation of the larval or pupal stages may, at times, serve for the continuance of the species in view of possible unfavorable conditions intervening, but a prolongation such as we interpret that related by our correspondent, would seem to be necessarily fatal to the entire delayed brood.

Remedies.

Any of the remedies named for *Bruchus pisi* would, of course, be equally efficient for this species. The following method, given by a correspondent of the *New England Homestead*, might be convenient where a large quantity of infested peas or beans are to be treated.

Take a large box—a common dry goods box will do—and line it air tight with tin, leaving a round hole with a cover eight or ten inches across. Put the beans or peas into this box through the hole, and into a box that will hold eighteen to twenty-five bushels put half a pound of chloroform, by pouring it on a cloth and shoving the cloth down to the bottom with a stick. Then put on the cover tight and let them stand five or ten days. This will kill all the grubs of the weevil, which are in the beans. After this, you can sack up your beans and have no more trouble from the weevil. The chloroform leaves not the slightest taste or smell in the peas or beans, and the cost need not be over two or three cents per bushel. I have been using the above recipe for the last twenty years and my peas always come out beautiful, and keep so if they are put in at once and as soon as they can be threshed.

Hymenorus obscurus (Say).

A Bark Beetle.

(Ord. COLEOPTERA: Fam. CISTELIDÆ.)

Cistela obscura SAY: in Journal of the Academy of Natural Sciences, of Philadelphia, v, 1826, p. 242.

I have a young orchard of some four or five hundred apple-trees just coming into full bearing, of select fruit. Part of these I noticed last season showed signs of disease, the leaves turning quite yellow, which at that time I attributed to the then prevailing drouth. I notice that it is extending farther in the orchard this season, and is cause for alarm. Upon investigation for the cause, I find the inclosed beetles, which are secreted under the old bark, and where found their abrasions extend to the wood, and a stain or discoloration as if caused

by a flow of sap, and in the immediate vicinity an entire absence of vitality of the bark. On one of the trees examined, the bark is entirely dead for eight or ten inches above ground to the roots, around three-quarters, or seven-eighths of the tree, and presents the appearance of being rotted by water. In my extremity I have determined to apply soft soap to the body, with the hope of arresting the ravages of the insect, until I can obtain farther light. If my explanation is sufficiently lucid to enable you to form an opinion of the character of the evil existing, please furnish a remedy which will arrest it.

J. W. M.

PERROWVILLE, VA.

The insects inclosed are bark beetles, and belong to the tribal group of which the larvæ occur under the bark, or in the decayed wood of trees which have long been dead. The perfect insects are generally found in the same situations, but occasionally they leave their natural abode, and may be captured abroad upon leaves and flowers, as is the habit of the family of *Cistelidæ*, to which the beetles sent belong. Thus *Cistela sericea* is said to be very common on flowers in Maryland in late summer and autumn.

The species submitted for identification, and for which a remedy is asked, is the *Hymenorus obscurus* (Say). There is no record of its being injurious to apple trees or to any other living vegetation, and as the *Cistelidæ* are not known to be obnoxious species, it does not seem at all probable, notwithstanding the suspicious circumstances under which it was found, that it can have been the cause of the injuries to the trees. In all probability the death of the bark for the large space near the roots above mentioned, from some unknown cause, first invited the deposit of the eggs of the beetle, as the decaying wood offered suitable food for the larvæ. These subsequently transformed to the perfect insect in the cavities where they were found, and when, of course, under such circumstances, they could do no harm. Some other cause for the impaired condition of the trees must be sought — perhaps other than insect attack. — *Country Gentleman*.

Meloe angusticollis Say.

The Oil-Beetle.

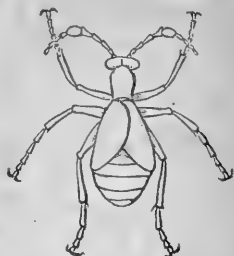
(Ord. COLEOPTERA: Fam. MEOLOIDÆ.)

Meloe angusticollis SAY: in Journ. Acad. Nat. Sci. Phila., iii, 1824, p. 280.

Some insects feeding on buttercups and also observed on clover were received from Perry, N. Y., with a request for their name and habits.

Description of the Beetle.

The insect, shown in the accompanying figure, is a soft-bodied beetle, three-fourths of an inch in length, of a glossy, dark-blue color, with a large ovate body, short, small, overlapping elytra, without wings, with long legs, the head heart-shaped, abruptly narrowed behind into a neck and bent downward, having the antennæ rather short, twisted and larger in the central joints in the male. Its scientific name is *Meloe angusticollis* Say.



The female is distinguishable by its antennal joints of nearly uniform diameter, its broader head, and its egg-shaped abdomen before oviposition so swollen with its burden of eggs that it can with difficulty be trailed over the ground. It is considerably larger than the male, measuring nearly an inch in length.

FIG. 15.—The oil-beetle, *MELÆ ANGUSTICOLLIS*, male.

Habits.

This strange-looking insect is popularly known as the oil-beetle, from a peculiarity which it has, when disturbed, of throwing out from the joints of its legs a thick, oily, yellowish fluid of a disagreeable smell, which is said to contain uric acid. It is an interesting species, from the singular habits and transformations of its larva. The eggs are deposited in the ground, probably in the vicinity of bees' nests, whence when hatched, the young larvæ, called *triungulins*, transfer themselves to the bodies of the bees, wasps, etc., and feed upon their juices. They also have been found living as parasites on various flower-flies and on some other Diptera. Their transformation is quite exceptional, in that instead of passing directly from the larva to the pupa, and then to the imago, as do other Coleoptera, exclusive of the blister-beetles, the second larva enters into a quiet stage in which it is known as the pseudo-pupa. It then passes into its third larval stage, in which it is active but does not feed, and afterward enters its pupal stage, thus existing in eight distinct states, counting the egg and the beetle.

The beetle possesses vesicating properties and is numbered among the blister-beetles. It has been employed as a substitute for the Spanish fly (*Cantharis vesicatoria*) of the shops and is said to be almost as powerful in its effects.

The oil-beetle is frequently met with in May, and again in August and September on buttercups (*Ranunculus*), and is also found creeping slowly over grasses and on the ground.

• *Epicauta vittata* (Fabr.).

The Striped Blister-Beetle.

(Ord. COLEOPTERA: Fam. MELOIDÆ.)

Lytta vittata FABRICIUS: Systema Entomologiæ, 1775, p. 260, No. 3.

The following communication under date of July sixteenth was received from a correspondent in Prospectville, Pa.:

Providentially, no doubt, aided considerably by incessant hard work in sprinkling with Paris-green and plaster of Paris, we have at last got rid of the Colorado-beetle (for this season at least) without much damage to our potato vines. In their place some old acquaintances have put in their appearance by millions, which were here about six years ago when they destroyed the mangold beet, and carrot crops. They have now taken the place of the Colorado beetles on the potatoes, and are equally as ravenous as the young beetles. They are easily driven off by sprinkling the vines with fine lime or plaster of Paris. There is no necessity of wasting Paris green on them, as they will not eat the leaves when dusted. I have driven them away in former years by simply lashing the vines with a cart whip or a hickory brush, driving them out of the field in regular armies, but the most certain way is to promptly dust the vines. As I do not know the name of this insect, I inclose one for a name and description.



FIG. 16.—The striped blister-beetle, *EPI-CAUTA VITTATA*.

The "old acquaintances" which are reappearing in immense numbers after a long interval are the striped blister-beetle, *Epicauta vittata* (Fabr.). It is a southern species not very often injurious in the State of New York, so far as my observations extend; occurring rarely in New England, according to Dr. Harris; sometimes in Canada, as stated by Mr. Saunders; but abundantly northward and westward of the Carolinas, extending to the foot of the Rocky mountains.

Food Plants and Voracity.

The beetle feeds upon a number of garden vegetables, but manifests a preference for the leaves of potatoes and tomatoes. They often make their appearance very suddenly, and have been known to defoliate large potato patches in two or three days. So serious often are their ravages upon potato vines that before the advent of the *Doryphora decemlineata*, it was frequently referred to as "the potato beetle," and Dr. Thomas, in the *Ninth Report on the Insects of Illinois*, cites it as the "old-fashioned potato-beetle." In the year 1880 it was unusually prevalent in the State of New York. Examples were sent to me from Bethlehem, Albany county, with the statement that it had

destroyed a garden in a single night, eating potatoes, beet-leaves, corn, etc. In 1887, it was received (Aug. 1) from Morton, Pa., where large numbers had collected upon a *Clematis flammula* and completely devoured its leaves, as also of another *Clematis* with similar but not fragrant flowers. It will thus be seen that its ravages are by no means confined to potatoes.

Remedies, Etc.

Perhaps the best preventive of the depredations of this insect when not very numerous is collecting by hand or by brushing them from their food-plants into broad vessels and destroying them. A large tin pan with some kerosene in the bottom would be convenient for the purpose.

It is stated in the *American Entomologist* (i. 1868, p. 24) that in seasons when they have swarmed on the potato vines in Ohio, their injuries were arrested "by placing between the furrows or rows some dry hay or straw and setting it on fire. The beetles were thus nearly all destroyed, and the straw burning very quickly did not injure the vines." The driving and dusting methods practiced by our correspondent, may also be employed with good effect. It is fortunate that there is only a single annual brood of these greedy pests, unlike the successive broods of the Colorado potato-beetle.

A Valuable Vesicant.

This insect, as its common name indicates, belongs to the family of the blistering beetles (*Meloidæ*), and is said by Mr. Wm. Saunders, who is excellent authority on the subject, to possess blistering properties *fully equal* to the well-known Spanish fly, *Cantharis vesicatoria* Linn.

Its Transformations.

The transformations of the *Meloidæ* have been studied with great interest by naturalists, and for a long time with very little success. Some of them were known in their early stages to be parasitic upon honey bees, attaching themselves to them by first climbing upon flowers, and passing from thence to the bees visiting the flowers. Others were believed to live in the ground and feed upon the roots of vegetables.

In an admirable paper published in 1877, by Professor Riley, "On the Larval Characters and Habits of the Blister-beetles," we were for the first time made acquainted with the life-history of some of the species, and among them that of the striped blister-beetle. The eggs are laid from July to October, in large masses, in holes excavated by the female in the ground, which she afterwards covers by scratching

with her feet. The places usually selected for their deposit are those in which grasshopper eggs abound. Hatching in about ten days they come to the surface, and may be seen running actively around, closely scanning every crevice for the concealed eggs. Having found one of the grasshopper egg-pods, it at once burrows into it, first devouring a portion of the shell of an egg, and then its contents. Nourished by the eggs, it undergoes three larval changes, when it leaves its food and constructs for itself a cell in the ground, where two additional larval changes are passed through before it assumes the pupa state. Its final transformation to the beetle follows a brief pupation of five or six days, making the eighth distinct form under which it has appeared. In the vicinity of St. Louis, where Professor Riley studied these transformations, the insect displayed a marked preference for the eggs of the grasshopper, known as *Caloptenus differentialis*.

Characteristic Features.

Those who are acquainted with our more common blister-beetles may readily separate the *E. vittata* from the others by its ovoid head of a reddish color, with black spots; its narrower thorax, longer than broad, having its greatest width behind, of a black color, and with three dull yellow lines (or of a yellow color with two black lines); its abdomen also broader and thicker behind, with black wing-covers margined with dull yellow and traversed by a yellow stripe. The antennæ, legs, and body beneath, are black, the latter covered with a grayish down. Its length is from five-tenths to six-tenths of an inch. The general appearance of the insect is shown in Figure 16, after Riley.

Epicauta cinerea (Forster).

The Margined Blister-Beetle.

(Ord. COLEOPTERA: Fam. MELOIDÆ.)

Meloe cinerea FORSTER: Nov. Spec. Ins., Cent. Prim., 1771, p. 62.

Mr. J. J. Thomas, of Union Springs, N. Y., under date of August thirtieth, submitted some beetles received from Mr. W. B. Whitmore, of Canton, Cherokee county, Ga., who desired to know what they were and the mode of meeting them.

It was stated in the communication accompanying, that "this is their first appearance in the locality, and that they are quite destructive to tomato plants. Attention is first drawn to them by the bare stems of the plants, upon which not a leaf is left. They are timid and drop to the ground when attempts are made to capture

them. They are very voracious and usually complete their work before they are discovered. They remain only about a week."

The insect is the ash-grey blister-beetle, *Epicauta cinerea* (Forst.), represented in Figure 17. It was formerly known as *Lytta marginata* Fabr., the margined blister-beetle, from the conspicuous margin of ash-colored hairs bordering the black wing-covers. The head, thorax, under side of the body and legs are covered with gray hairs. This insect, in the perfect stage, is usually found feeding on certain wild plants. It often occurs on the potato, and sometimes in injurious numbers. It might naturally be expected to attack the tomato, but I have no recollection of its having before been reported as depredating injuriously upon this plant. Other species of *Epicauta* feed readily on the potato, and may therefore be found hereafter on the tomato.



FIG. 17.—The margined blister-beetle, *EPICAUTA CINEREA*.

E. cinerea is a common species throughout the Eastern, Middle, and Western States, extending over a large portion of the United States.

***Epicauta Pennsylvanica* (De Geer).**

The Black Blister-beetle.

(Ord. COLEOPTERA: Fam. MELOIDÆ.)

Meloe Pennsylvanica DE GEER: Mem. serv. Hist. Ins., v. 1775, p. 5, No. 16.

A package received from Baltimore, Md., contained the following note of insect injury and inquiry for means of arrest:

I send you by mail a box containing some black bugs which lately have appeared in very large numbers in my garden, feeding upon the cabbages and carrots, to which for the present they seem to confine themselves. They wholly strip the leaves of the carrots, leaving the bare ribs of the leaf. What are they and what would you propose for their destruction?

The insect is the black blister-beetle, whose scientific name is given above. It is identical with the species known until recently as *Lytta atrata* Fabr. Its color is black throughout, being entirely destitute of the colors, spots, or stripes of the other species. Its size is also less than that of *E. vittata* or *E. cinerea*, measuring only from four to five-tenths of an inch in length.

Its Food.

It often occurs in destructive numbers in potato fields, and may commonly be met with during the month of September on the flowers of the various golden-rods, to which it is attracted for food. It also visits china-asters and other flowers. Prof. E. S. Goff, of the Wisconsin Agricultural Experiment Station, has sent it to me as feeding,

in August, on the common annual garden pink, *Dianthus Hedderwigii*. I have found it abundantly at Wilmington, in the Adirondack mountains, N. Y., on the flowers of a wild mustard, *Brassica nigra*.

According to Professor Forbes, in August of 1885, it was very common in corn-fields in Illinois, associated with *E. cinerea* and *E. vittata*, all of which were feeding freely upon the fresh silk of corn, doing a very considerable mischief by preventing the fertilization of the kernel and partially blighting the ear. Occasionally *E. Pennsylvanica* was seen eating the kernels at the top of the ear. Professor Goff has also reported it as eating off the tip end of the young ears, in Wisconsin.

This is the first time that I have heard of its attacking either the cabbage or the carrot, and upon referring to all the notices of this species at my command, I do not find either included among its food-plants.

Remedies.

The remedy usually employed against its ravages is to beat them from the plants into a hand-basin containing some kerosene and water. As in attempting to beat them from the plants many may fall within the leaves and be held there, I would suggest dusting the plants with pyrethrum powder. Some quite successful experiments have been made with this powder upon the beetle, at Ithaca, N. Y., as narrated in the *American Entomologist*, iii, 1880, p. 193.

Numbers of them were rapidly defoliating a passion-flower vine, when upon applying the powder they were immediately affected, as was shown by vigorous efforts to remove the substance from their legs. In three minutes they were unable to walk. The vine was completely freed from the attack for a week, until after a rain, when a few of the beetles again appeared. The pyrethrum does not kill at once, but paralyzes the beetles and renders them helpless, until they finally die.

Pomphopœa Sayi LeConte.

Lytta Sayi LECONTE: in Proc. Acad. Nat. Sci., Phila., June, 1853, vi, p. 336.

This blister-beetle is much less common than the preceding ones, but in June, 1885, it occurred in great numbers at Frankfort, Herkimer county, N. Y., where it was observed by Mr. A. Casler feeding on wheat, the leaves of the butternut and on locust blossoms, continuing for about a week, during the latter part of the month. Although a collector of insects, the species had never come under his observation before. It had been taken by me, in single examples, at Schoharie, N. Y., during the month of June, in preceding years.

Podisus spinosus (Dallas).*The Spined Soldier-bug.*

(Ord. HEMIPTERA: Fam. PENTATOMIDE.)

Arma spinosa DALLAS: List Hemip. Br. Mus., i, 1851, p. 98, 7.

I mail with this note a box containing three specimens of an insect which has recently appeared as a destroyer of the Colorado potato-beetle. At first the farmers mistook them for an additional damage to the crop, and were dismayed, but investigation revealed them as a blessing. They are very voracious, and destroy a vast number of larvæ and bugs in the larval or soft state, which is the time when they most injure the vines. The inclosed insects were confined under a glass for about an hour with six fully grown pupæ, when, unfolding a slender proboscis, they fastened it to some portion of the bug, following it about as it attempted to escape, never for an instant relaxing their hold till their bug was dead. They are so very lively that I was obliged to inclose them in cotton to prevent their escape, that they may reach you alive. If Eastern potato growers are so overwhelmed with potato bugs as Western farmers have been, it would not seem a whimsical idea to import some of these destroyers to their devastated fields.

F. T.

CARBON CLIFF, ILL.

The insect accompanying the above interesting communication, is recognized as one of our most efficient allies in the contest with the

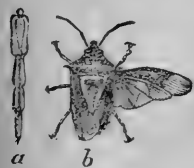


FIG. 18.—*PODISUS SPINOSUS* (Dallas).—a, the beak or proboscis enlarged; b, the insect with one wing extended.

Colorado potato-beetle, viz., *Podisus spinosus* (Dallas); or, as it has been properly named from a spine which projects from its thorax on each side, and from its bold, soldier-like habit of attack, "the spined soldier-bug." It is a true bug, belonging to the order of *Hemiptera*, among which are numerous species which render us valuable service in preying upon our injurious insects, after the manner above described. It is shown in Figure 18. The suggestion of the importation of this parasite, is one

which could easily be carried into effect, and which should be done were it not that it is already an inhabitant of the Atlantic States, and of common occurrence (as also over a large portion of the United States), and has long since entered upon, and continued to prosecute, its valuable work in the reduction of the number of the Colorado potato-beetle as well as many other insect pests, as cut-worms, the caterpillars of other *Lepidoptera*, etc.

Prionidus cristatus (Linn.).**The Nine-pronged Wheel-bug.*

(Ord. HEMIPTERA: Fam. REDUVIDÆ.)

Cimex cristatus LINNÆUS: in Amoen. Acad., vi, 1763, p. 399, 42; Cent. Ins. rar. 1763, p. 16, 42.

A number of peculiar-looking insects surrounding the eggs from which they had apparently but recently emerged, were received for indication of name, habits, and food, from Burlington, N. J., where they had been found on a "copper beech"—a variety of the European beech, *Fagus sylvatica*, having a crimson purple foliage.

They were true bugs of the order Hemiptera (Heteroptera), and belonging to the family of Reduviidæ. They were quite young, being

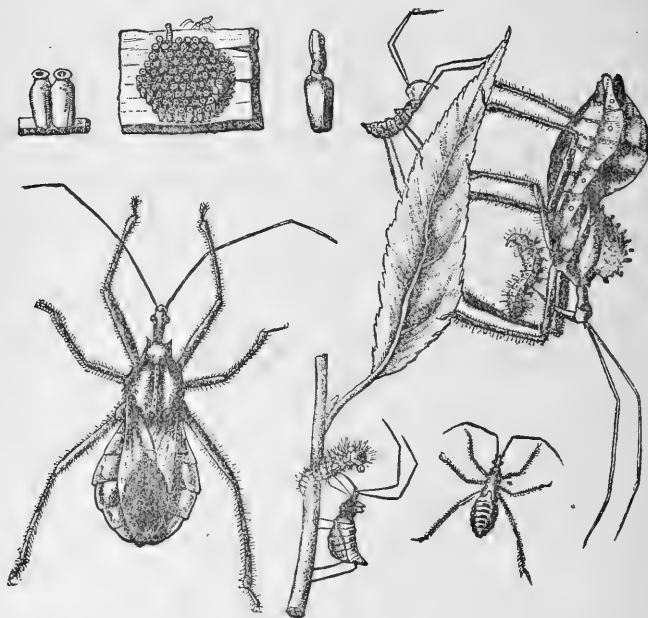


FIG. 19.—The nine-pronged wheel-bug, *PRIONIDUS CRISTATUS*, in its young and mature forms; also, its hexagonal egg-mass, eggs enlarged to show their flask-shape, and an egg giving out the larva.

in their first larval stage. As at this period the members of this and allied groups differ greatly from their mature forms, I was unable to refer them positively to the "wheel-bug," *Prionidus cristatus* (Linn.), but without much doubt they were of that species. The eggs from which

*Mr. Uhler, in his *Check-list of the Hemiptera-Heteroptera of North America*, has proposed for this species the generic name of *Prionidus*, on the ground that the *Prionotus*, of Laporte, is preoccupied.

they had escaped, correspond closely with the description and figures given of those of the "wheel-bug." They are arranged side by side, on end, in a hexagonal cluster of about sixty, each one shaped like a short flask, somewhat compressed on the four sides, and opening for the escape of the larva by a rounded cover with a central depression. The young larvæ are queer looking spider-like creatures, with their long legs and antennæ, and the body, when distended with food, several times broader than the head and thorax. The abdomen is red, while all the other portions of the insect, except the orange terminal joint of the antennæ, are of a shining black.

In the figure given, *P. cristatus* is illustrated in its several stages. The flask-shaped eggs are shown in enlargement (one with the insect escaping from it) and in their natural size as arranged in a cluster. The larvæ are given in different attitudes and in feeding, and the mature insect (enlarged about one-half) in a dorsal and side view.

A Carnivorous Insect.

The insect is one of those which may claim our protection wherever met with, as it renders valuable service in the destruction of large numbers of injurious insects, especially, in its younger stages, of aphides or plant lice. As with its increase in size it acquires additional strength, it preys upon caterpillars, chrysalids, and does not hesitate to attack other insects several times larger than itself. While gregarious in the early larval stage, they will readily feed upon one another, as was shown in the examples sent me, of which, although they were furnished with a liberal supply of aphides, there are at the present time of writing but two survivors, which for security have been given separate apartments.

A Combat.

The caution, persistence, courage, and ferocity which these young creatures display in capturing and subduing their larger prey is surprising and exceedingly interesting to observe. As a test of their power I had given to one of the larvæ a pupa of the rose-leaf tyer, *Penthina nimbata* (Clemens)—perhaps fifteen times its own size. Its approach to its victim was by an imperceptible movement; not a foot was lifted, although the intervening space could be seen gradually to lessen; only the antennæ were observed in slow motion. When with its hinder legs holding to the side of the box, its front prehensile limbs had glided over and upon the body of the pupa, an attempt was made, apparently, to insert therein the tip of its formidable three-jointed proboscis. A sudden and violent contortion

of the pupa threw it off, but not into retreat. Its front legs were slightly withdrawn, but still in position just above the writhing body, in readiness to descend, as they did, with the same imperceptible movement as before, as soon as the alarm of the attacked pupa had subsided into quiet. Again, the touch of the beak compelled a temporary withdrawal, through the twisting of the abdominal pupal joints. Time and again — perhaps fifty times — was this performance repeated during the two hours, nearly, of the continuance of the contest, when it was finally ended, not, as I had expected, by the burying of the long beak securely within the body of its victim, but by the daintiest insertion of its extreme tip (hardly more than a simple contact) in one of the wing-covers, and the probable transmission of a poison that speedily arrested further struggles. The richly-earned repast that followed was an ample one, for in ten minutes the abdomen of the bug had expanded into at least ten times its previous size.

Stinging Power.

While the natural habits of these insects are not of an injurious character, they may not with safety be taken into the hand. With their robust and needle-pointed beak, they are capable of penetrating the flesh and inflicting a painful and annoying wound. It is related that the pain resulting, on one occasion, from a wound of this wheel-bug could only be alleviated by repeated ammoniacal applications, and that the subsequent sloughing off of the flesh a few days thereafter, left quite a cavity in the hand.

The two larvæ referred to as sole survivors of a large company, were accidentally killed a short time before they were in readiness for their final molting.

Its Predaceous Habits.

The following communication received from Maryland relating to *Prionidus cristatus*, gives some interesting particulars of its predaceous habits, and of the appearance that the insect would present to the general observer:

We have been familiar for several years with a species of parasitic insect that seems to prey specially upon the tent caterpillar, being so voracious in its appetite that a very few of them will clean out quite a large nest of these pests. I have not the name at hand, but it is well known to naturalists, and is commonly called the "Devil's Horse."

It has a black or dark body and legs, with a powerful pair of mandibles for holding its prey, and an abdomen of an orange to a red color, standing out at an angle of 45° above the rest of the body.

To-day I find a new insect, to me at least, eating these, or rather sucking them out and leaving nothing but the dark frame and legs.

The new insect is more of a yellow color shaded to dark orange at the extremity, has six legs, two long feelers, and is provided with a proboscis as long as its body, through which it draws its food. It is one-half inch long; the body and head are on a curve, forming nearly a half circle; the eyes quite large and dark, in a slender yellow head.

It is a new thing to me to see one parasite thus destroying another, but it may not be so to naturalists.

The box contained the larval form of *P. cristatus* and several skins apparently of the same species, which may have been the skins cast off at the molting of the insect, or the dried remains from which the juices had been sucked by individuals of its own species.

That insect parasites and cannibals prey upon one another is no new thing in science; it is simply in obedience to a common law in nature. The cannibal propensity of the "devil's horse" (or as it is perhaps more commonly named, the nine-pronged wheel-bug, from the nine prominent teeth with which its thoracic crest is armed), in both its larval and perfect states, has long been known. If several of them are confined in a box, with no other food, they will invariably destroy one another, by sucking out the juices, until only a single one will be found remaining.

The "new insect," above described, was probably a larva of the *P. cristatus*, which, having passed through several moltings, differed in appearance from the insect less advanced, upon which it was discovered feeding.

Pulvinaria innumerabilis (Rathvon).

The Maple-tree Scale-insect.

(ORD. HEMIPTERA: Subord. HOMOPTERA: Fam. COCCIDÆ.)

Coccus innumerabilis RATHVON: in Pennsylvania Farm Journal, iv. August, 1854, pp. 256-258.

The above-named scale-insect is one of the largest of its kind, and is so conspicuous from the white, cottony mass that it secretes, that it often comes under observation and arouses interest in its character and habits.

It is frequently found infesting grapevines, and to grape growers it is known as the grapevine scale-insect; but it more often occurs on the maple, particularly the soft maple, *Acer dasycarpum*. To an inquiry from Parkersburg, Va., under date of June eighteenth, for information of the insect which was infesting, to an alarming extent, the maple shade trees of the vicinity, the following reply, in substance, was made:

The Scale.

The specimens sent, attached irregularly to the lower surface of maple leaves, about twenty on each, are white, cottony masses of from three to nearly four-tenths of an inch long, about one-half as broad, of a suboval form, bearing upon the narrower end a scale, somewhat flattened down, which is darker marginally, oval, broader posteriorly, where it is excavated and apparently cleft for a short distance on the median line; in front is a medial carina for about one-fourth or one-third the length, some granulations on each side, usually five transverse wrinkles or folds and about the same number of raised lines running outwardly on each side to the hinder margin.

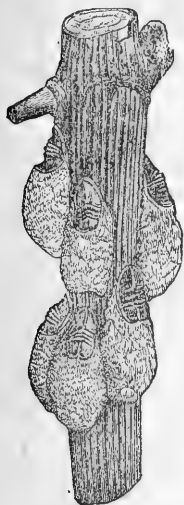


FIG. 20.—The maple-tree scale-insect, *PULVINARIA INNUMERABILIS*.

This insect belongs to the *Coccidæ*, or as more commonly known, scale-insects. Its common name, drawn from the tree upon which it more frequently occurs, is the maple-tree scale-insect.

History.

The species was first described by Dr. Rathvon, of Lancaster, Pa., in the year 1854, who found it occurring "in such countless millions" upon some linden trees, that he gave it the name of *Coccus innumerabilis*. A few months thereafter (in 1855) Dr. Fitch received examples of it from an osage orange hedge in Ohio, and deeming it identical with a fig-tree *Lecanium* of Europe, the *L. caricæ* of Fabricius, he simply described and figured it, with the remark that if it should prove to be a new species, it might be known as *Lecanium macluræ*—the specific name (suggested by Mr. Kennicott, from whom the examples came), taken from the plant on which it occurred.* In the year 1860, the species again came under the notice of Dr. Fitch, as infesting maples at Albany and vicinity, and not recognizing it as the osage orange insect, he proposed for it the name of *Lecanium aceris-corticis*. In 1868 it was received by Messrs. Walsh and Riley as infesting maples and also as occurring on osage orange, and was described

*See summary of Dr. Fitch's paper on this insect in *First Report on the Insects of N. Y.* 1882, p. 301.

by them as two distinct species under the names of *Lecanium acericola* and *L. machuræ*.

Although marked differences have been pointed out in the several forms named above, they are believed by those who have most closely studied them, to be the same species with that first described by Dr. Rathvon, and now known as *Pulvinaria innumerabilis*.

Food-plants.

While a number of our scale insects appear to be either confined to a single plant or limited to closely allied species, this scale insect, from some peculiar adaptation to varied conditions, has quite an extensive range, having been reported as found on maple, box-elder, osage orange, linden, locust, sumach, beech, willow, grape, currant, and rose. Possibly some of these may prove to be distinct forms. It was found by me on the Virginia creeper, *Ampelopsis quinquefolia*, at Tivoli, N. Y., on June 11th of the present year, the eggs giving out their young five days thereafter.

Life-history.

The life-history of this and of other scale insects are full of interest, but they can not be briefly given, and therefore those who desire to become acquainted with them should refer to some of the many papers in which they have been treated at length. This particular species has been the subject of an elaborate paper of some fifty pages and two plates, by the late J. Duncan Putnam, of the Davenport [Iowa] Academy of Natural Sciences, which, from the extremely careful study of which it is the result, may justly serve as a model for similar biological work.

For the scientific study of the family, reference may be had to a "Report on Scale Insects," by Professor J. H. Comstock, contained in the *Annual Report of the Commissioner of Agriculture*, for the year 1880 (pp. 276-349, plates iii-xxii). A second report on the same insects, in continuation of Professor Comstock's special study while Entomologist to the U. S. Department of Agriculture, is published in the "Second Annual Report of the Cornell University Experiment Station." It is devoted to one of the sub-families of the *Coccidæ*, viz., the *Diaspinæ*, and treats of 121 species, a number of which are for the first time described. In addition to these, nearly fifty species of other North American *Coccidæ* are noticed.

Remedies.

As the scale-insects when they abound are exceedingly injurious to the vegetation that they attack, it is of great importance that all who

are liable to suffer from their injuries should know how they may best be destroyed. Although serious pests, they are not beyond control if the proper remedies are resorted to.

When scale-insects are discovered infesting a few trees in an orchard, or are confined to a quite limited locality, the trees containing them should be cut down and burned at once, as the best way to arrest the spread of the evil.

The species that attack only the trunks and larger branches of shade and other trees, may often be destroyed by scrubbing with a stiff brush, wet with strong soap-suds.

When the foliage is infested, a garden syringe or a force-pump must be employed for spraying the insecticide used. The two best insecticides for the purpose are soap and kerosene. The first has been thoroughly tested in many experiments made by, or under the direction of, Professor Comstock, and is strongly recommended by him, to be used in the following manner: In a gallon of hot water one-fourth of a pound of whale-oil soap is dissolved, and its application is made at a temperature of about 100° Fahr. It should be repeated after an interval of a few days. As the result of other experiments subsequently made, it is stated that one pound of concentrated lye to one gallon of water, will effectually destroy all scale insects, drying up the scales and the eggs beneath them, and killing the young insects if hatched. It is asserted, however, by Professor Riley, that whale-oil soap and lye both fail to kill the eggs of scale-insects, and he therefore urges the use of kerosene as greatly superior to them, and decidedly preferable to any other known substance for the eradication of these pests.

The most simple way to apply the kerosene is to mix it with water, for undiluted it is destructive to many kinds of vegetation, while not affecting others. As it separates quite quickly from the water — in less than a half-minute — it requires to be kept in constant agitation, which may be done by discharging the syringe or pump several times into the vessel before applying the liquid to the trees, and continuing to alternate the discharge from the tree to the vessel.

The Kerosene Emulsion.—But, by far, the best way in which to use, with perfect safety, kerosene for insecticidal purposes, is to make an emulsion of it with some substance that will bring it into the desired condition. Milk was first employed, but subsequently it was found that soap was preferable, from several considerations, such as cost, convenience, permanency, etc. The method of preparing this emulsion has been repeatedly given in entomological publications and agricultural

journals, but perhaps in consideration of its efficacy, it can not be too often repeated. Briefly stated, in a simple sentence, it is this: The emulsion is produced by violently agitating through the nozzle of a force-pump until emulsified in a homogeneous mass, two gallons of kerosene combined with one gallon of a hot soap solution, made by dissolving a half-pound of common soap in a gallon of water. The ordinary dilution of the emulsion for general use is one part of the emulsion to nine parts of water.

As quite an amount of labor attends the production of the emulsion, it would seem to be desirable that the "kerosene butter," as it has been called, should be manufactured in quantity and placed in the market for sale as are a number of other insecticides of far less merit. Its cost of production is so slight that the price at which it could be offered and command, we believe, a ready and extensive sale, could not fail of yielding a large profit to the enterprising manufacturer who would undertake to bring it properly before the agricultural community.

As a Grapevine Pest.

As previously stated, this insect frequently occurs on grapevines. It was received by me from a gentleman in Essex county, Mass., with the following note:

I send you to-day a piece of grapevine cane with several cocoons, as they appear to be, upon it; and a few grape leaves with a different but similar cocoon on them. The vines are under glass, but the specimens were taken from different houses. I have never seen such before and do not know whether they belong to a friendly or injurious insect. Will you please give me some information regarding them.

As the reply made contained some items not given in the above notice, portions of it are herewith presented.

The pieces of vine and accompanying leaves are infested by a pernicious enemy of the grape — the *Pulvinaria innumerabilis* (Rathvon). It is one of the obnoxious family of *Coccidæ* (subfamily of *Lecaninæ*), nearly all of which possess remarkable powers of multiplication, and eventually, if left to themselves, increasing until they nearly or quite cover the surface of the plant or tree on which they occur. When they have become so numerous as this they cause the death of the plant, as their nourishment is drawn from the juices by means of a proboscis inserted through the bark.

In the examples received, the milk-white cotton-like mass that protruded from one end and the sides of the brown suboval scale,

presented three or four times the surface of the scale. Within it were contained the numerous eggs of the mother scale insect.

About the first of July the young lice were developed from these masses and spread themselves over the jar in which the twigs had been placed, appearing as myriads of minute ochreous-yellow atoms; too small to disclose any structure to the unaided eye. These, under natural conditions, would have distributed themselves over the vine and soon have become stationary by attaching themselves to the bark by their proboscis, gradually increasing in size until the following summer, when they (the females) would present the appearance of these large scales raised at one end by the cotton-like substance thrown out from beneath.

The scales attached to the vine, in the examples received were of the usual dark-brown color, while those which occurred upon the leaves, and apparently of the same species, were of a dull yellow-green, approaching in color to that of the surface on which they were placed and on the under side of the leaves only. At the present time these latter, from their peculiar color, can hardly be distinguished from the cotton-like mass beneath them.

This insect has been thought by some to be one of our many imported pests, as but slight differences have been discovered between the European species known as *Pulvinaria vitis*, but it is now generally accepted as distinct. It is so great a pest that every pains should be taken to eradicate it as soon as its presence is detected. The leaves infested by it should be plucked and destroyed, and all the scales scraped from the vines whenever they are observed. In the very young stage of the insect (occurring at the present time — the first week in July) the greater part of the new brood can be killed by going over the infested portions of the vine with a stiff, thickly set, bristle brush, as in their early state they are quite tender and can be easily crushed. Spraying with a weak solution of carbolic acid, before the young are protected by their scales, would also destroy them. A strong soap solution is often sufficient for killing them at this stage. Later, when the scale has become fully formed and fastened to the vine, it would be necessary to use the kerosene emulsion or a strong alkaline wash.

Bibliography.

In a notice of this insect communicated to the *Country Gentleman* for July 5, 1883, most of which has been included in this article, some of its literature is given. As possibly affording some facilities for reference, it is presented here, without addition of omissions or of

later publications, which there is not the time at the present writing to collate.

Coccus innumerabilis RATHVON: in Pennsylvania Farm Journal, Aug., 1854, iv, pp. 256-258, with figure.

Lecanium caricæ FITCH: in Country Gentleman for Jan. 18, 1855, v, p. 38, with figure.

Lecanium acericorticis FITCH: in Trans. N. Y. State Agricul. Society for 1859, xix, 1860, pp. 775, 776.

Coccus aceris LEIDY: Report to the Council of Philadelphia on Insects Injurious to Shade Trees, 1862, pp. 7, 8 (erroneous determination).

Lecanium acericola WALSH-RILEY: in American Entomologist, i, 1869, p. 14, fig. 8a.

Lecanium machuræ WALSH-RILEY: in ib., fig. 8b.

Lecanium acerella RATHVON: in Lancaster Farmer, July, 1878, viii, pp. 101, 102.

Lecanium acericola. THOMAS: in Prairie Farmer for July 22, 1876.

Lecanium acericola. PUTNAM: in Proceedings Davenport Acad. Nat. Sci., i, 1876, p. 37; in Davenport Daily Gazette, for June 5, 1877; in Transactions Iowa Horticultural Society for 1877, xii, 1878, pp. 317-324.

Lecanium acericorticis. GLOVER: in Report Commissioner of Agriculture for 1876 (1870), p. 44, No. 53.

Lecanium acericola. E. A. SMITH: in Prairie Farmer for March 2, 1878; in 7th Report Insects Illinois, 1878, pp. 120-131, figures.

Lecanium acericola. LINTNER: in Count. Gent. for July 4, 1875, p. 425.

Pulvinaria innumerabilis. PUTNAM: in Proceedings Davenport Acad. Nat. Sci., ii, 1879, pp. 293-346, pls. 12, 13.

Pulvinaria innumerabilis. COMSTOCK: in 2d Report Cornell University Experiment Station, 1883, p. 137.

Aphis brassicæ (Linn.).

The Cabbage Aphis.

(Ord. HEMIPTERA: Subord. HOMOPTERA: FAM. APHIDIDÆ.)

Aphis brassicæ LINNÆUS: Systema Naturæ, 12 edit., ii, 1767, p. 734, No. 12.

The following note relating to perhaps the most common and injurious plant-louse known to the vegetable garden, was received from a correspondent in Laceyville, Ohio:

Inclosed I send you a piece of a leaf from a rutabaga turnip. The insects, like those on the leaf, attacked my crop of turnips when the bulbs were about one-fourth grown, and arrested further growth.

The tops are now nearly destroyed, and the crop almost a failure. I tried dusting with plaster, but it did no good. Please tell me what this is, and if there is any remedy.

When going after the turnip leaf, I crossed a young apple orchard, and cut the inclosed twig from one of the trees. Many of the trees were infested in the same way.

H. L.

The insects on the piece of turnip-leaf are a species of plant-louse known as *Aphis brassicæ* Linn., figures of which are herewith given.

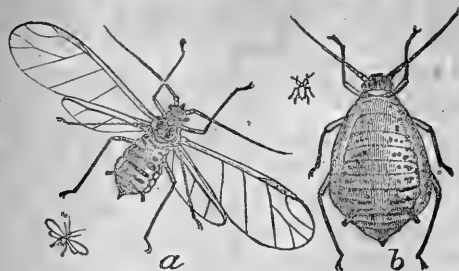


FIG. 21.—The winged and wingless viviparous females of the cabbage aphid, *APHIS BRASSICÆ*.

It is an European species, and probably was imported to this country at the time of, or soon after, the introduction of the cabbage. Both in Europe and America it has proved to be exceedingly destructive to the cabbage, although usually it fails, through the reduction made upon its numbers by its enemies, to entirely destroy the crop. Occasionally entire fields have been ruined by its unusual abundance. Its fondness for the rutabaga turnip has long been known, and its injurious operations to the crop, similar to that above stated, have frequently been recorded.

The aphides received are of various sizes, indicating old and young individuals. Among them are a few winged specimens, apparently females. These have been minutely described by Dr. Fitch in his 11th Report on the Insects of New York, contained in the Transactions of the New York State Agricultural Society for 1886, vol. xxvi, to which reference may be made. The young are egg-shaped, of a dull pale green color, and looking as if dusted with a grayish powder. Their antennæ and legs are blackish; a row of small black dots may in some be seen along each side of the back.

Remedies.

Lime thrown over the infested plants would prove more serviceable than plaster. Sprinkling with soap-suds is also recommended, but will seldom kill the older aphides. Probably the greatest benefit would be derived from the use of tobacco water—about a pound of tobacco to a gallon of hot water—the better if the water be applied when quite warm. Pyrethrum powder, or a kerosene emulsion, would also destroy all that could be reached by them. Unfortunately, congregating as they do usually, on the under side of the leaves, it is difficult to reach them by ordinary applications.

Apple-tree Aphis.

The insects on the apple twig are the common, destructive, and widespread apple-tree aphis, the *Aphis mali* Fabr., and is almost always to be found upon the leaves or twigs of our apple trees, but more particularly at the time of the starting of the buds and unfolding of the leaves in early spring. Its injuries to the tender vegetation at such time are known to all.

Gryllotalpa borealis (Burm.).*The Mole Cricket.*

(Ord. ORTHOPTERA: Fam. GRYLLIDÆ.)

BURMEISTER: Handbuch der Entomologie, ii, 1838, p. 740.

The mole-cricket, which has received its name from its mole-like operations within the ground, does not often come under observation, but as it occurs abundantly in some localities and is then the occasion of quite an amount of unsuspected injury, it is desirable that its habits and character should be known.

The communication relating to it below is from Woodbury, N. J.:

I herewith mail a specimen of an insect for identification. It is evidently quite plentiful about here but is seldom seen. It burrows in the ground, and from its hiding place makes a noise similar to the note of the common cricket. It also seems perfectly at home when put in water, swimming and diving with great facility. When alive the thorax is at least one-third the length of the whole body, which presents a brilliant velvety appearance throughout. Will you please give name and characteristics.

Description.

The northern mole-cricket, distributed over most of the United States east of the Rocky mountains, "is about one inch and a quarter in length, of a bay or fawn color, and covered with a very short and velvet-like down. The wing-covers are not half the length of the abdomen, and the wings are also short, their tips, when folded, extending only about one-eighth of an inch beyond the wing-covers. The fore-legs are admirably adapted for digging, being very short, broad, and strong, and the shanks (tibiæ), which are excessively broad, flat, and three-sided, have the lower side divided by deep notches into four finger-like projections that give to this part very much the appearance and the power of the hand of the mole." (Harris). The feet of the front pair of legs are nearly concealed and quite peculiar in structure. They are attached to the outside of the shanks and are three-jointed; the first is large, flattened, excavated, claw-like, and curved; the second is similar in form, but less than one-third the size; the third is quite small, oval and bears two terminal, slender, nearly straight claws. The insect is represented in Figure 22 in its natural size.



FIG. 22.—The Mole cricket, GRYLLO-TALPA BOREALIS.

Habits.

Our mole-cricket lives in the ground, usually in moist earth — often on the sides of ponds or small streams, where it burrows into the moist ground at a depth of from six to eight inches, by means of its front pair of legs which are admirably constructed for digging. Its eggs are laid in these galleries, in a tough sac, to the number of from two to three hundred, within a chamber scooped out for the purpose. Here it feeds on such roots of plants as may come within its way. Occasionally these crickets occur in large numbers, when they may become very injurious, destroying grass and garden vegetables, and in one instance they are said to have nearly ruined an entire crop of potatoes. They are nocturnal in their habits, sometimes leaving their burrows at night to come abroad, and, in the larger-winged species, disport in short flights. They are believed to partake occasionally of animal food, as of worms and the smaller insects and even of one another, if pressed by hunger. The female is said, at times, to consume large numbers of her young. Their chirp differs from that of other crickets, in being a dull, interrupted, jarring sound, which has been compared to that of the goat-sucker.

The song of the male during the warm nights of early summer has been described as “a low, continued, rather pleasant trill, quite similar to that of the common toad, but more shrill.” Mr. S. H. Scudder has written at some length of “The Chirp of the Mole-cricket,” in *Psyche*, for October, 1875, i, p. 105-6. He has written its notes, and has described them as “a guttural sound, like *grü* or *grëu* repeated in a trill indefinitely, but seldom for more than two or three minutes, and often for a less time. It is pitched at two octaves above middle C. * * * The note sounds exceedingly like the distant croak of toads (*Bufo*) at spawning season, but is somewhat fuller.”

The ability and readiness of our species to swim in water has not, so far as I know, been recorded of it. It has also the ability of moving backwards in its burrows with great facility, which must be a great convenience to it in constructing and in traversing its narrow galleries.

Remedies.

In Europe, where the species are far greater pests than in this country, to the extent that they are regarded as “the greatest enemy the gardener has to contend with” in certain localities in Germany and elsewhere, various means have been recommended for the suppression of their ravages, among which are the following: Pouring water into their burrows first and then a few drops of oil, to stop their respiration; burying small garden pots containing a little oil of turpentine, covered so as to keep out the earth, to

kill with the vapor or drive away by the scent; destroying the eggs in June and July by following up the winding burrows, and digging up the nests. A method recommended by Kollar and approved by Curtis, as probably the best where the insect abounds, is to dig pits in the ground in the autumn, of a foot in diameter and two or three feet deep, to be filled with horse-dung and covered with earth. At the first frost, all the crickets will be attracted to and congregate in these pits for warmth, where they can be conveniently killed.

Other Species.

Gryllotalpa longipennis Scudder, is a less common species, occasionally found in New York and Massachusetts, and more frequently in some of the Southern States. Dr. Thomas has recorded it from Arkansas.

Gryllotalpa Columbia Scudder, is cited by Prof. Fernald in his "Orthoptera of New England," as differing only from *G. borealis* in its larger size and comparatively greater breadth of wing-cover. Its habitat is given as Massachusetts, Maryland, and Washington, D. C.

The common mole-cricket of Europe is the *Gryllotalpa vulgaris* — broadly disseminated and very destructive. Curtis' *Farm Insects* may be consulted for its life-history and other interesting particulars of it.

Melanoplus femur-rubrum (De Geer).

The Red-legged Grasshopper.

(Ord. ORTHOPTERA: Fam. ACRIDIDÆ.)

Acridium femur-rubrum DE GEER: Mémoires pour servir à l'histoire des Insectes — Orthoptera, iii, 1773, p. 498, pl. xlii, fig. 5.

The communication given below, received from Brentsville, Va., in July, 1877, records an instance of unusual multiplication and to an injurious extent, of one of our common Eastern locusts, which is so seldom the cause of notable harm to the agriculturist, that each occurrence of the kind is deserving of record. A still more remarkable instance of this occasional multiplication, is that of *Melanoplus atlantis* (a species so closely allied to *M. femur-rubrum* that it has only recently been separated from it by Professor Riley) in the Merrimac valley, New Hampshire, in the years 1882 and 1883, as recorded by Professor Riley in his annual report to the Department of Agriculture for the year 1883 (pp. 170-180, pl. 2) — the Department having been appealed to for aid, if it might be given, in suppressing its ravages:

I send you specimens of grasshoppers, which are very destructive in this immediate neighborhood the present season. The pests were first discovered about the tenth of May, on low meadow-land subject

to overflow. They were at that time not more than one-eighth to one-fourth of an inch long, and then of a rather dark or muddy-green color; a large portion of them changing to a yellow and brown-yellow color as they grew. At the present time, most of them are one to two inches long. Are they the common meadow grasshopper or a new species? I want information as to whether the same locality or place is likely to be overrun and eaten by them another year, or for a series of years?

They are very numerous; have totally eaten up hundreds of acres of meadow and pasture, and have done considerable damage to corn and oats. They have eaten eighty acres of meadow so closely for me, that I shall not be able to get one wagon-load of hay. They spread off the low ground, after consuming the grass, to the higher portions of the meadows, and thence to other fields.

The grasshoppers are the common red-legged species known to science as *Melanoplus femur-rubrum* (De Geer), illustration of which is given in Figure 23. It has an extensive distribution throughout



FIG. 23.—The red-legged locust, *Melanoplus femur-rubrum*.

the United States ranging from the Atlantic to the Pacific coasts, and from British Columbia to Florida and Mexico. East of the Mississippi it occurs more commonly and numerously than any other locust. It is closely

allied to the destructive species of the Western States—*Melanoplus spretus*—for the investigation of the history of which, and the discovery of means for controlling its ravages, an entomological commission was appointed by Congress in the year 1877, and its results published in two large octavo volumes. The two are so much alike that it is thought that they may eventually be accepted as the same species under local modifications—being alike in coloration, and differing mainly in the length of their wings, and form of the terminal segment.

The ravages of our common eastern species have at times, especially in New England, approximated in certain localities, to those of the dreaded *M. spretus* of the west. It is quite as voracious—feeding upon every green thing, not excepting tobacco, burdock, etc., and even consuming clothing, and the rough outer surface of pine boards. It occasionally becomes migratory, collecting in clouds, rising high in the air, and taking long flights. Fortunately, it is of very rare occurrence that they appear in such numbers, as the several conditions needed for their excessive multiplication are seldom combined.

It by no means follows that a district of country suffering under their visitation the present year, will be infested to the same extent the coming year; it is within the range of possibility that it may be followed by an unusual exemption from attack. The grasshoppers,

when the period for the deposit of their eggs shall arrive, may be in such an enfeebled condition from want of a proper supply of food or other causes, that the eggs deposited by them will lack the vitality necessary to their safe hibernation, or may be eaten by the predaceous insects or mites that often prey upon them; or the young larvæ, while still tender and delicate in the spring, may be largely destroyed by unusual frosts or severe rains.

In what has been above written, the insects have been called *grass-hoppers*, in accordance with a popular usage, which it would be futile to attempt to change. Strictly speaking, they are not grasshoppers, but true *locusts*, and it would be well if we would earnestly endeavor to correct in ourselves and in our children the misnomer which has obtained such general currency. It need not make confusion with the *seventeen-year locust*, for that has no valid claim to the name of locust, but is a "cicada."

This species is the *Acridium femur-rubrum* of Dr. Harris, Dr. Fitch, and other early writers. Later, it was known as *Caloptenus femur-rubrum*. In 1873, Dr. Stal, in consideration of structural differences, separated this species and its allied forms from *Caloptenus* of Serville, under the name of *Melanoplus*. This has been accepted by Mr. Scudder (see his "Remarks on *Caloptenus* and *Melanoplus*; with a notice of the Species found in New England," in his *Entomological Notes*, vi, contained in *Proc. Bost. Soc. Nat. Hist.*, xix, 1878, pp. 40-45), and has also been followed in recent publications of Professors Riley, Comstock, Fernald, and others.

SOME APPLE-TREE INSECTS.

I am an amateur fruit-grower and trying to learn all that I can about the insects which injure apple trees. Inclosed you will find two specimens of larvæ found under the bark of my apple trees. The bark is loose and dead in strips from one to six inches wide and from six inches to two or three feet high, on the trunks of the trees. At first glance one might think it to be sun-scald, but these places are sometimes found where the sun does not shine, and it seems to me that an insect eats the alburnum, or the inner bark. The larva No. 1, inclosed, I find in large quantities on the trees, under this dead bark. None are larger than this, but many are smaller; some just hatched. The smaller ones are of a darker color than this, and slimy like a snail without a shell. What I think are the eggs, are like very small drops of dew piled up in a jelly-like mass. I wish all the information about them that you think may be of use to me. If they have not injured the trees, can you tell me what has injured them, and how they should be treated? The orchard has been set about twenty years.

Specimen No. 2, I think, is the larva of the codling-moth, as I find them on different parts of the tree, under the rough bark. Am I mistaken? There are some flat-headed borers at work on my trees, but they seem to be confined to the ends of the small limbs nearest the ground. The ends of the limbs are invariably dead, and the borer is generally found in the dead wood. I have never found the young borer in the green wood. Does the borer kill the end of the limb, or does it only occur here because the wood is rotten, or the bark easy to get under? I am cutting off all these dead tips, and hauling them out to be burned. In the spring I intend to wash the trunks of the trees and the large limbs with the carbolic acid wash recommended by Mr. M. B. Bateham, page 535, in the volume of the *Country Gentleman* for 1876 [also in 2d Report on the Insects of New York, 1885, p. 25]. Am I doing the right thing? With 2,000 trees to care for, you will see that it will be no small job.

W. E. G.

CARROLLTON, KY.

The larvæ found under the bark are footless maggot-like worms, about three-eighths of an inch long by one-eighth broad, quite pointed in front when the very small head and extensile anterior segments are extended; rounded behind, with a short cylindrical terminal projection. The two larvæ sent are apparently of the same species, but in different stages of growth—one having two lateral rows of short spines, and the other being destitute of them. They are probably larvæ of some species of fly, of which, in this stage, I have no knowledge. From the known habits of the larvæ of the Diptera, it does not seem at all probable that these could have occasioned the separation of the bark. After the injury had occurred, the eggs may have been deposited where the proper conditions were found for the sustenance and development of the young larvæ. If additional examples of these forms—the more advanced ones—can be sent in a living state, the perfect insect can perhaps be bred from them. Their occurrence in large numbers under the above conditions is of considerable interest.

Specimen No. 2, is, as supposed, the larva of the codling-moth, *Carpocapsa pomonella*.

The occurrence of the flat-headed borer (*Chrysobothris femorata*) in the ends of the small limbs of apple-trees is quite new to me, for I can find no mention of it in the writings of any of our economic entomologists. Its habitat has heretofore been given as in the trunks and larger limbs of apple-trees. It is not at all improbable that this form is a distinct species from *C. femorata*, and with different habits. And, indeed, the large numbers of very different trees upon which *C. femorata* is stated to occur, leads us to believe that we are confound-

ing several species. Among the food-plants given for it are mountain-ash, linden, box-elder, beech, plum, pear, cherry, peach, apple, oak, hickory, and soft maple. Whether or not Mr. Henshaw is correct in citing in his Check list of Coleoptera and supplement, six varieties and two synonyms of *C. femorata*, could best be ascertained by rearing the larvæ and carefully studying their habits and modes of occurrence. I would be glad to receive specimens of the larva in the terminal ends of the branches, taken from the trees in the month of April next, for verification of its determination as the "flat-headed borer."

The carbolic acid wash referred to gives promise of being of benefit, and it is very desirable that it should be thoroughly tested, and the result reported.

NOTICES OF ARACHNIDA.

Ixodes bovis (Riley).

The Cattle Tick.

(Ord. ARACHNOIDEA: Fam. IXODIDÆ.)

Ixodes bovis RILEY: in Spec. Rept. Comm. Dept. Agricult., on Diseases of Cattle, 1871, p. 118.

I send you a sample of lice, or ticks, that are found on cattle that have died in several localities in Bucks and Montgomery counties. Will you please give a name for them, their mode of propagation, how and where propagated, and, if practicable, also a method for killing them.

J. M.

CARVERSVILLE, PA.

The ticks are the *Ixodes bovis* of Riley, which frequently infests horned cattle, and occasionally other animals, in the Southern and



FIG. 24.—The cattle-tick, *IXODES BOVIS*. (After Packard.)

Western States, particularly in Texas, whence it is sometimes known as "the Texas cattle-tick." When received they were gorged with blood, and their bodies distended to an immense size (for a mite), the largest measuring five-tenths of an inch in length by four-tenths of an inch in diameter, as shown in the upper part of Figure 24. Soon after their reception, they deposited large masses of minute, rounded, translucent, brown eggs to the number of hundreds, from a single individual. From these the young will probably soon be produced, perhaps in four or five weeks,

judging from the development of allied species. They will have but six legs, while in the adult form the number is eight. When mature, they are flattened, leathery, reddish, seed-like forms, with an oblong-oval body and long legs, as shown in figure.

Description.

The mature insect is described as follows by Dr. Packard, in the "Annual Report of the Peabody Academy of Science," April, 1869, p. 68, and in the *Sixth Annual Report of the United States Geological Survey of the Territories*, for the year 1872 (Hayden), 1873, p. 740:

A reddish, coriaceous, flattened species, with the body oblong-oval, contracted just behind the middle; head short and broad, not spined behind, with two deep round pits; palpi and beak together, unusually short; palpi long and slender; labium short and broad, densely spined beneath; above, the mandibles are smooth, with terminal hooks; thoracic shield distinct, one-third longer than wide, smooth and polished, convex, with the lyrate mesial convexity very distinct. The whole body is sparsely covered with minute hairs. Legs long and slender, pale testaceous red; coxæ not spined. Length of body, 0.15 of an inch; width, 0.09 of an inch.

Habits.

By the aid of the teeth and hooks, with which the mouth parts of the tick are furnished (see accompanying figure), it penetrates the skin of the animals which it attacks, and burying its head and anterior portion of its body in the opening made, it gorges itself upon the blood. They have been known to occur in such numbers upon cattle as almost to cover them, being so closely crowded together in portions of their body "that a knife-blade could scarcely be thrust between them." It is easy to conceive that in such cases death would naturally ensue from the attendant loss of blood, the resulting inflammation and, as it is thought, the poison thrown into the wound. It is not confined to cattle, but has been found on other mammals, as the porcupine and hare, and on some reptiles.

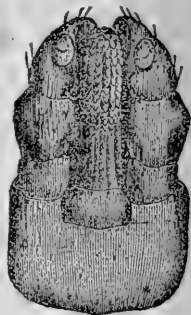


FIG. 25. — Mouth-parts of *IXODES BOVIS*. (After Packard.)

In an instance recorded by Murray, it was taken from the neck of a miner in Utah, a portion of whose skin was left adhering to the rostrum, as may be seen in the specimen preserved in the British Museum.

Dr. Hagen has published in *Entomologica Americana* for November, 1887 (iii, p. 124), an interesting account of *Ixodes bovis* having been removed alive, by John Orne Green, M. D., of the Harvard Medical School, from the ear of a man, where its presence had been indicated by itching and obstruction of the passage, dating back to a residence on a cattle ranch in Arizona, four months previous.

Other Species of Ixodes.

Other species of the genus are known to attack the human species, and instances are recorded of persons having suffered severely from the wounds of the *Ixodes Americanus* Linn., *I. unipunctatus* Pack., *I. cruciarius* Fitch, and others. A species of tick occurring in Persia, the *Argas Persicus*, is said to be so exceedingly venomous that death frequently results from its bite in less than twenty-four hours. A nearly allied species, *Argas Americanus* Packard, has been taken from cattle in Texas.

Remedies.

An effective remedy for the *Ixodes bovis* when occurring on cattle, will be found in a strong kerosene emulsion, which could be applied with a force pump and thoroughly rubbed in by hand. An application of kerosene and lard — one part of the former and three parts of the latter — rubbed in with a rag while warm, has been recommended in Bulletin 5 of the Iowa Agricultural Experiment Station, for destroying lice infesting cattle, and would doubtless be effective against the cattle-tick.

Bryobia ? pratensis Garman.

Infesting a Dwelling-house.

(Ord. ARACHNOIDEA: Fam. TROMBIDIDE.)

The following notice of a mite that is becoming very troublesome from its frequent invasions of dwelling-houses and other buildings, appeared in the *Ohio Farmer* of March —, 1889:

Mrs. J. H. O., of Napoleon, Ohio, writes that a small insect has taken possession of her house and wishes to know what it is. Of its abundance she says: "

"They seem to be most troublesome in rooms we do not occupy every day. They resemble chicken vermin, but are different in color. When very young they look like specks of brick dust, but do not move when they are of that size. When they are old enough to travel they look like specks of blood moving around. The fully grown ones are of a brown color with red legs. They seem to come from out of doors, crawling through every crevice, under windows and base boards. They climb up the walls and windows. The tops of my curtains were nearly covered before I noticed them. They will stick on them and breed, and along the border of the carpet. One year ago this spring I noticed a few along the edge of the carpet. I took up the carpet and scalded the floor with hot soapsuds, and did not see any more until last fall. I have tried everything that I could hear of that would kill insects, but nothing will have any effect on them except kerosene, when I can get it to touch them, but it will soon evaporate, and then they will come thicker than before. I have never

seen or heard of anything like them, and do not know how to get rid of them."

The trouble is probably caused by a small red mite related to the red spider of the greenhouse which not unfrequently invades houses in the manner described by our correspondent. It apparently feeds on green vegetation, and the warm sunshine of early spring brings it out of its winter quarters to search for food.

The above, together with a subsequent communication to the *Ohio Farmer*, given below, were submitted to me for further reply. My answer covering, as far as could conveniently be done, both inquiries, was published in the *Ohio Farmer* of April 13, 1889.

EDS. FARMER.—The small red mites described in a late number of your paper, have made their appearance in countless numbers in our house, for three successive years, each year increasing in numbers. How can we get rid of them? We are more interested in the cure than in the natural history of the pest. An early reply will greatly oblige us.

Mrs. E. H. C.

BLOOMINGDALE, MICH.

In all instances like the present, of any unusual occurrence of a pest, particularly when they infest our homes and seriously interfere with our comfort, it is quite desirable that a scientific determination of the species be made, in order that the circumstances attending the invasion, may become a part of the life-history of the insect or the creature. While a remedy for the intrusive guests may be all that is desired by their host, yet the scientist deems it quite important that he should know the particular species for which he is asked to prescribe a remedy. Treatment that may be fatal to one member of a genus may be harmless to another. I would therefore esteem it a favor if Mrs. E. H. C. would send me examples for identification, if they are still to be found, of the mite, about which inquiry is made.

So far as we may judge from the features and habits of the mite, as given in the issue of the *Ohio Farmer* on page 214, it is probably a species of *Bryobia*, one of the "harvest mites," belonging to the family of *Trombididae*, and related to the common "red spider," *Tetranychus telarius* of our gardens, house-plants, and greenhouses.

Notices of Swarming Mites.

The above mite may have been the same species that was reported to me on June 16th last, as occurring in the vicinity of Albany, N. Y., in large numbers in a house that had been newly lathed, plastered and painted, but of which no particulars were given. Another occurrence, of perhaps the same mite, during the month of May, in Susquehanna county, Pa., was noticed by me in the *Country Gentlemen* of

June 9, 1881. Its presence was first observed on a kitchen window, and subsequently, in a box of clothing, in a seldom-used chamber, and upon the walls, floor and furniture of the corner of the room where the box was standing.

Still another instance of a house infested by these "swarming mites," is reported by Professor Riley, in his report for the year 1884, page 413 [129], as follows: "Specimens of some of the almost omnivorous species of the mite, genus *Bryobia*, were sent by Mrs. I. H. Easterbrook, Providence county, R. I., with the statement that these insects were all over her house, inside and out, where they were first discovered about the eighth of May. Mrs. E. found, under the window-sills on the outside, webs, where they seemed to be hatching.

* * * Specimens of the same were also sent in May by Mr. George N. Kimball, of Waltham, Mass., with a similar account of their habits."

Two species of *Bryobia* infesting and injuring meadows, have been described by Mr. H. Garman, in the *Fourteenth Report on the Insects of Illinois*, 1885, pp. 73, 74; and in *Insect Life*, 1889, pp. 277-279, Professor F. M. Webster has published "Notes on a Species of *Bryobia* Infesting Dwellings" at Lafayette, Ind., which may be identical with the species upon which my present notes are based. See also an article on "Late Autumnal Occurrences of Mites in Great Numbers" in *Insect Life*, i, 1889, p. 252.

The mites (*Acarina*) have received little study, either in Europe or in this country. Comparatively few American species are known. Very little has as yet been learned of their habits. The division to which the common "red spider" belongs, known as "spinning-mites," from the fine, almost invisible web that they construct, are found on plants, and are believed to be entirely vegetarian, while the harvest mites, to which *Bryobia* pertains, are, in part, predaceous and carnivorous. These latter are often found in vast numbers out of doors, in fields, on various plants, under stones, on gravel walks, on pieces of wood, in damp moss and decaying leaves, on the sand of river banks, as parasitic on insects and other animals, etc. No satisfactory reason can be assigned for their entering dwellings-houses in such numbers as above reported. It is not probable that their natural food is found in sufficient abundance in such localities. It would seem that their entrance is usually made through a window, and it may be that their intrusion is merely for the purpose of securing a sheltered place where they may oviposit (their breeding on curtains and edges of carpets is mentioned in the communication from Napoleon, Ohio).

Perhaps, in this instance, they had been feeding upon the minute *Psoci* and other small insect forms that are usually found in the crevices and between the overlapping siding of wooden dwellings during the spring months.

Remedies.

We are unable to give the result of any experiments made in destroying these mites in an infested dwelling, but from what is known of their nature, we would suggest the following as effective and simple remedies: 1. Flour of sulphur, distributed with a powder bellows. 2. Fresh pyrethrum powder, applied in the same manner, or in liquid form with a spraying apparatus. The Woodason bellows and atomizers, made at 451 Cambria street, Philadelphia, are excellent for these uses. 3. Kerosene, but preferably benzine, applied with an atomizer. In using the latter, air the room thoroughly before lights are introduced. 4. Fumigate, by burning brimstone in a metal vessel floating in a tub of water (to prevent setting fire to the room), the room being first tightly closed and so kept for several hours. This remedy may be resorted to where the entire apartment, walls, ceiling and floor are swarming with the mites.

Note.

From a notice in *Insect Life*, ii, 1890, pp. 278-9, which appeared since the above was presented for publication, of a mite infesting a house in Wilmington, Ohio, after the same manner as recorded from the other Ohio localities, and which was determined by the Division of Entomology at Washington as *Bryobia pratensis*, it seems quite probable that all these instances above noticed may be referred to the same species—entering houses for hibernation or breeding, and occurring and feeding on clover and grasses out of doors.



A P P E N D I X .



(A.)

LIST OF PUBLICATIONS OF THE ENTOMOLOGIST.

The following is a list of the principal publications of the Entomologist during the year 1889, giving title, place and time of publication and a summary of contents. A similar list of publications by the Entomologist, during the years 1880 and 1881, is appended:

Apple-Tree Tent-Caterpillar.* (Country Gentleman, for April 4, 1889, liv, p. 269, c. 1, figure — 29 cm.)

A belt of eggs on a peach tree twig, received from Warwick, N. Y., with inquiries, are those of *Clisiocampa Americana*. The belt is described and figured, and recommendation made of the collection and destruction of the egg-belts as directed, as the most effective means of preventing the ravages of the caterpillars.

Apple-Tree Bark-Louse. (Country Gentleman, for April 4, 1889, liv, p. 269, c. 2 — 13 cm.)

To an inquiry from Huron, Ont., of the best time for destroying this pest, *Mytilaspis pomorum*, its most vulnerable time is stated to be when the eggs are hatching, which is usually at the time when the trees are putting out their blossoms.

Remarkable Display of Eel-Worms. (Country Gentleman, for May 16, 1889, liv, p. 389, c. 1, 2 — 44 cm.)

A remarkable red appearance in a shallow stream at Saratoga Springs, N. Y., which has excited considerable attention, is found to be owing to the presence of myriads of small red worms belonging to the *Anguillulidae*, and commonly known as "eel-worms." The conditions under which they were occurring are stated, as also their susceptibility to alarm and sudden disappearance, and their habits and appearance, as subsequently observed, in confinement. Remarks on the *Anguillulidae* in general and on some of the species.

Preserving Insect Specimens. (Country Gentleman, for May 23, 1889, liv, p. 409, c. 2, 3 — 13 cm.)

In reply to information asked, directions are given for preparing a "cyanide bottle" for the collection of insects, and the address of W. E. Saunders, 240 Central avenue, London, Ont., from whom insect pins for mounting specimens, may be obtained.

* The capitalization, etc., of the *Country Gentleman* is followed herein in the citation from it of titles of publications.

Cabbage Maggot. (Country Gentleman, for June 6, 1889, liv, p. 440, c. 4—10 cm.)

An infusion of burdock (its method of preparation given) is recommended as a remedy for attack if the larvæ have not burrowed into the stalks; if in that state, then take up the plant and destroy it, together with any larvæ that may be in the ground adjacent. Other remedies are caustic lime applied to the roots, unleached ashes about the plant, and kerosene emulsion.

Apple Tree Worm. (Country Gentleman, for June 6, 1889, liv, p. 440, c. 4—13 cm.)

For information of this insect reference is made to articles in the C. G. of June 21 and July 5, 1888, and April 4, 1889. The caterpillar is again very abundant and destructive the present year in Eastern New York. It may so easily be destroyed by methods that have been repeatedly pointed out, that to permit its injuries is a crime. The cost of its neglect is shown.

Rose-bug Destroying Peaches. (Country Gentleman, for June 6, 1889, liv, p. 441, c. 1—12 cm.)

If the old remedies used against this insect, *Macroductylus subspinosus*, such as jarring on sheets, and dusting the foliage with plaster, slaked lime, oak ashes and road dust be found insufficient, then the remedy that the Rural New Yorker claims to be the simplest and most effective of all might be tried, viz., to spray the insect with pyrethrum powder in water — one tablespoonful to a gallon of water. Results asked for.

The Rose-Leaf Hopper. (Country Gentleman, for June 6, 1889, liv, p. 441, c. 1—20 cm.)

The *Tettigonia roseæ* of Harris, first appears early in May and matures late in the month. Whale-oil soap or tobacco water will kill the young larvæ. Pyrethrum powder will also kill them and their pupæ. Pyrethrum in water, and hellebore powder in water, and kerosene or a kerosene emulsion may also be used. It is more difficult to kill when it has become winged. It may then be driven on cloths saturated with kerosene or on tarred surfaces.

[The Forest Tent-Caterpillar Devastating Maples.] (Albany Evening Journal, for June 8, 1889, — 14 cm.)

Account of the ravages of *Clisiocampa sylvatica* as observed June sixth in a maple grove at Kingsbury, Washington county, N. Y. Not a leaf remained on trees seventy feet in height and two feet diameter of trunk.

Butternut trees had also been defoliated, but the insect could not be found.

Parasite on Potato Beetle. (Country Gentleman, for June 13, 1889, liv, p. 456—457, cols. 4, 1—26 cm.)

The parasite enveloping the potato-beetle in Roslyn, N. Y., is *Uropoda Americana* Riley. Its history is given, its description, place in classifi-

cation, its method of attaching itself to its host, and other insects on which it has been observed. Effort should be made to introduce this parasite in localities where it does not occur.

Grain Aphis. (Country Gentleman, for June 13, 1889, liv, p. 457, c. 1—10 cm.)

Examples of Aphides sent and reported as killing wheat in Allendale, Ill., are the grain aphis, *Siphonophora granaria* [should have been given as *S. avenae*]. It is occasionally destructive, but does not promise to be so in this instance, as parasites are associated with it. No means are known by which formidable attacks of this insect can be arrested and the crop saved.

Apple-Tree Flies. (Country Gentleman, for June 13, 1889, liv, p. 457, c. 2—8 cm.)

A fly occurring "by millions" on apple-trees at Meadville, Pa., [June 4] is the white-winged Bibio, *Bibio albipennis*. Their appearance; abundance of their larvæ in fields at times and their food; harmlessness of the fly; why they resort to fruit-trees; reference to *Second Report Insects New York*, for additional information.

The Hop-yard Pest Reappears. (Albany Evening Journal, for June 20, 1889, p. 1, c. 7—21 cm.—Utica Morning Herald, of June 21, 1889.—Fort Plain Free Press, of June 25, 1889.—Country Gentleman, of June 27, 1889, p. 497, c. 1.)

Hop leaves sent from Glen, Montgomery Co., N. Y., show the presence of the hop-aphis in numbers sufficient to indicate a severe attack. A brief outline sketch of its history is given. The best preventive is destruction of its eggs on plum trees and of all wild plum trees in hop districts. The best remedies for attack are found in kerosene emulsion or fish-oil soaps. Method of preparing the emulsion and its proper strength. How the quassia and soap-wash used in England is made. Importance of immediate spraying infested fields.

The Currant Aphis. (Country Gentleman, for June 20, 1889, liv, p. 474, c. 3—21 cm.)

In reply to inquiry from Nicola Valley, British Columbia, of how to destroy the plant-lice that cluster on the tips of currant stems, answer is made that dipping the stems in, or spraying them with, pyrethrum water or tobacco water will kill most of them. All may be destroyed by a strong kerosene emulsion, as also its eggs in the autumn or winter if they are deposited on the stems. Undiluted kerosene may perhaps be used with safety. *Myzus ribis* is usually not very injurious—causes the leaves to curl badly; its life-history is not known. This species may not be *M. ribis*.

Asparagus Beetle. (Country Gentleman, for June 20, 1889, liv, p. 478, c. 2, 3—10 cm.)

Crioceris asparagi is identified in examples from Hartford, Conn.—its introduction and distribution; is best destroyed by air-slaked lime; reference to publications on it.

Grain Aphis. (Country Gentleman, for June 27, 1889, liv, p. 496, c. 3, 4—14 cm.)

Identification of *Siphonophora avenae* on wheat from La Grange, Ill. Why it should be known as *avenae* instead of *granaria*. Is not "a new insect" or the "wheat-midge" or the "green-midge" of recent agricultural and other journals. Prospects of its injuries in Indiana and Illinois to wheat this year.

Insect Depredations. (Country Gentleman, for June 27, 1889, liv, see p. 496, c. 4—11 cm.)

Remarks on the grain aphid on wheat in Indiana, reported by the press as "green midge," "wheat midge," etc. What it is, and its injuries this year and in preceding years.

Our Insect Enemies and How to Meet them. An Address before the New Jersey State Board of Agriculture, at its Annual Meeting at Trenton, February 1, 1889. Camden, N. J. [July], 1889, 8 vo., 22 pp.

Importance of Agriculture—its present and future. Economic Entomology. Importance of Entomological Study. The Secrecy of Insect Depredations. The Small Size of Insects. Number of Insects. Rapidity of Propagation. The Voracity of Insects. Can Insect Ravages be Prevented? How to Meet our Insect Enemies.

Early Appearance of the Common House-fly and its Fungus. (Albany Evening Journal, for July 11, 1889.)

Musca domestica has appeared in large numbers in Albany during the present week, while it rarely abounds before August—the result of the remarkable meteorological conditions of the year. The fungus peculiar to the fly has also attacked it. The early occurrence of this fungus, of rust on oats, and other fungi, indicate an unusual prevalence this year of rusts, blights, mildews, etc.

The Corn Worm. (New England Homestead, for July 13, 1889, xxiii, p. 237, c. 1—16 cm.)

Gortyna nitela is identified in a caterpillar sent from Hartford, Conn., feeding on the tassels of corn. While it has numerous food-plants, it is not recorded as an external feeder—always hitherto as a borer into stems or stalks or fruit. Description of the caterpillar, and in what particulars this example differed from others seen. Will probably not injure the tassels to the extent of interfering with proper pollenization.

Insects on Lima Beans.—Squash-bugs. (Country Gentleman, for July 18, 1889, liv, p. 543, c. 2—23 cm.)

In reply to inquiries from Monroe county, N. Y., of means for checking the ravages of an unknown insect that eats off Lima bean-plants just below the seed leaves—of the striped squash-bug—and the larger squash-bug, answer is made: The bean insect can not be named from

the mere statement made of its habits. The ravages of the cucumber beetle, *Diabrotica vittata*, may usually be prevented by dusting the plants with plaster of Paris and Paris green in the manner mentioned. The squash-bug, *Anasa tristis*, must be fought by destroying its eggs, by trapping as directed, and by repellants to prevent oviposition.

Remedies for the Hop-louse. (New England Homestead, for July 27, 1889, xxiii, p. 253; c. 6—22 cm.)

The best known remedies, are spraying the vines on the first appearance of the insect with the kerosene and soap emulsion (formula given), or the quassia and soap wash of the English hop-growers (formula also given). By the proper use of the above means, serious losses may be averted.

The Yellow Woolly Bear. (New England Homestead, for July 27, 1889, xxiii, p. 253; c. 6.—12 cm.)

A caterpillar attacking many garden plants in Providence county, R. I., is *Spilosoma Virginica*, known in the winged state as "the white miller." The appearance and habits of the insect are given. They should be picked from the plants and crushed.

The Grain Aphis. (Country Gentleman, for August 1, 1889, liv, p. 579, c. 2—15 cm.)

Heads of rye from Stone Ridge, N. Y., show attack of this aphis, *Siphonophora avenæ* (Fabr.). Although the insect has been unusually abundant in several of the Western States this year, this is the only instance reported to me of its presence in New York. The heads contained seven examples of the aphis, each one of which had been parasitized. If the parasite can be reared, its name will be given hereafter.

Maple-Tree Borer. (Country Gentleman, for August 1, 1889, liv, p. 579; c. 2, 3—23 cm.)

Grubs working injuriously under the bark of maples in Stamford, Conn., are probably those of *Glycobius speciosus*—a beautiful but pernicious beetle. A preventive of its attack would be painting the trunk during July and August, from about its middle to (and including) the base of the principal limbs with soft soap and crude carbolic acid. A remedy is found in cutting out the young grub during August and September, when its presence is shown by the exuding sap, or later by its "frass" or castings.

The Cow-Fly. (Country Gentleman, for August 1, 1889, liv, p. 579, c. 3—20 cm.)

To a request from Freehold, N. J., for information regarding the cow-fly [*Hematobia serrata*], notices of it in the *Country Gentleman*, vol. liii, 1888, pp. 705, 759, 777, and 893 are referred to. For preventives of attack, applications to the cattle of the following are suggested: Kerosene, carbolic acid, soluble phenyle, tar-water, tansy-water, and naphthaline.

Insects in Wheat—Not Injurious. (The Rural New Yorker, for August 3, 1889, xlviii, p. 509, c. 1, 2—19 cm.)

Small, shining, black beetles, from Nebraska, found in browned and shriveled heads of wheat, are *Phalacrus politus* (Linn.). They are scavenger beetles, belonging to the Necrophaga. Remarks on the family of *Phalacridæ*. The wheat heads on which these beetles occurred had been attacked by the "smut" fungus, and the beetles had undoubtedly been drawn to the infested heads to feed upon the fungoid material, as is known to be the habit of an allied species, *Phalacrus penicillatus* (Say). The species is therefore to be regarded as a beneficial insect, and not an injurious one as was supposed by the sender.

Oak-Tree Pruner. (Country Gentleman, for August 29, 1889, liv, p. 651, c. 3, 4—12 cm.)

Sections of branches of red oak received from McGregor, Iowa, show the pruning by *Elaphidion parallelum* of unusually large branches. One section of an inch in diameter was completely severed, with the exception of a thin film of the outer bark. Another section of one inch and one-fourth was not so completely cut. Reference to a notice of the insect at some length in the *Country Gentleman* of September 9, 1886.

A Bombarding Beetle. (Country Gentleman, for September 5, 1889, liv, p. 671, c. 1—23 cm.)

The discharge of a "bombardier" is described and the effects of the vapor. All of the species of *Brachinus* have this means of defense, of which *B. fumans* is a common form. Bombardiers are also found in other genera, as in *Anthrenus*, of Europe.

Black Blister Beetle. (Country Gentleman, for September 12, 1889, liv, p. 694, c. 2—15 cm.)

A beetle destructive to Chrysanthemums at Poughkeepsie, N. Y., is *Epicauta Pennsylvanica* De Geer. Its feeding habits are given. The remedies for it are beating from the plants into a basin of water with kerosene, or dusting with pyrethrum powder—one part to four of flour.

Mites in Bran. (Country Gentleman, for September 19, 1889, liv, p. 711, c. 2—9 cm.)

Inquiry is made from Holliston, Mass., of how to destroy a small white mite infesting bran stored for summer use (no examples sent). The mite is probably *Tyroglyphus siro*. The infested bran could be safely fed to stock. Should it become necessary to arrest the multiplication of the mites, they could be killed by tightly inclosing the infested bran, after placing upon it an open vessel containing bisulphide of carbon, in quantity proportioned to the amount of bran. The descending vapor would destroy all the animal life present.

The Peach Tree Borer—*Ægeria Exitiosa*. (Country Gentleman, for November 14, 1889, liv, p. 861, c. 1—3—50 cm.)

In reply to inquiries from Salem, N. J., are given: 1, the name and food-plants of *Ægeria exitiosa*; 2, description and figures of the moths; 3, the egg-laying from June to September (see C.-G. for February 9, 1888);

4, length of egg and caterpillar stages; 5, pupal development and transformation into the imago; 6, best preventives and remedies, as mounding, repellant washes, cutting out the borer — the last, the most effective.

The White Grub of the May Beetle (*Lachnosterna fusca*). (Transactions of the N. Y. State Agricultural Society, vol. xxxiv, for 1883-1886, [July] 1889, pp. 5-33, figs. 1-5.)

A reprint, with additions, of Bulletin 5 of the New York State Museum of Natural History. For contents, see *Fifth Report on the Insects of New York*, 1889, p. 308.

Cut-Worms. (Transactions of the N. Y. State Agricultural Society, xxxiv, [July] 1889, pp. 66-100, figs. 1-28.)

A reprint, with additions, of Bulletin 6 of the New York State Museum of Natural History. For contents, see *loc. cit. sup.*, p. 308.

The Aphididæ or Plant-Lice. (Transactions of the N. Y. State Agricultural Society, xxxiv, [July] 1889, pp. 101-115, figs. 1-9.)

A reprint (with illustrations and additional matter) from the Proceedings of the Western N. Y. Horticultural Society, 1887. For contents, see *Fourth Report on the Insects of New York*, 1888, p. 194.

Insects in Cord Wood. (Country Gentleman, for November 14, 1889, liv, p. 862, c. 3 — 10 cm.)

Sounds from wood stored in a dry cellar, can not, as supposed, be from worms or spiders, nor can the noise, as described, be caused by insect burrowers. From the statement as made, no satisfactory explanation can be offered.

A Horn-Tail and its Enemies. (Country Gentleman, for November 21, 1889, liv, p. 881, c. 2, 3 — 23 cm.)

A horn-tail, received from Flanders, N. J., within its burrow in a piece of maple, is *Tremex columba* (Linn.). The characteristic features of the insect, and of the burrow inclosing it, are given, with remarks on the parasitism to which it is subject, as suggested by a portion of the ovipositor of its natural enemy, *Thalessa*, which has been broken off and is imbedded within the block of maple.

Report of the State Entomologist to the Regents of the University, State of New York, for the year 1888. (Forty-second Annual Report of the Trustees of the State Museum of Natural History, for the year 1888 [November 20], 1889, pp. 145-347, figs. 1-50.) *Fifth Report on the Injurious and Other Insects of the State of New York* [November 23d], 1889, pp. 205, figs. 50.

The contents are: TRANSMITTAL: REMEDIES AND PREVENTIVES OF INSECT ATTACK: Cutting out the Squash-vine Borer. Change of Soil for Strawberry Plants. Brine for the Currant-worm. Saltpetre not a Preventive of Cabbage-fly Attack. Preventives of Cabbage-fly Attack. Beans for

Repelling the Striped Cucumber Beetle. Gas-lime for the Woolly-Aphis. How to Kill the Apple-tree Aphis. Tobacco Dust for Aphis Attack. A Lime Wash for Bark-lice. INJURIOUS HYMENOPTERA: *Nematus Erichsonii Hartig*—The Larch Saw-fly. *Nematus salicis-pomum Walsh*—The Willow-apple Gall Saw-fly. INJURIOUS LEPIDOPTERA: *Darapsa Myron (Cramer)*—The Green Grapevine Sphinx. *Alypia octomaculata (Fabr.)* and *Eudryas grata (Fabr.)*—The Eight-spotted Forester and the Beautiful Woodnymph. *Phobetron pithecium (Sm.-Abb.)*—The Hag-Moth Caterpillar. *Anisota senatoria (Sm.-Abb.)*—The Senatorial Oak Moth. *Agrotis saucia (Hübner)*—The Variegated Cut-worm. *Mamestra picta Harris*—The Zebra Cabbage Caterpillar. *Mamestra grandis (Boisduval)*—A Poplar-feeding Cut-worm. *Penthina nimbata (Clemens)*—The Rose-leaf Tyer. *Incurvaria acerifoliella (Fitch)*—The Maple-leaf Cutter. INJURIOUS DIPTERA: *Hæmatobia (Lyperosia) serrata Rob. Desv.*—The Cow-horn Fly. INJURIOUS COLEOPTERA: *Dynastes Tityus (Linn.)*—The Spotted Horn-bug. *Oberea bimaculata (Oliv.)* The Raspberry-cane Girdler. *Galeruca xanthomelæna (Schrank)*—The Elm-leaf Beetle. INJURIOUS HEMIPTERA: *Clastoptera obtusa (Say.)*—The Alder Spittle-Insect. *Siphonophora avenæ (Fabr.)*—The Grain Aphis. *Myzus cerasi (Fabr.)*—The Cherry Aphis. INSECT ATTACK AND MISCELLANEOUS OBSERVATIONS: The Canker-worm—*Anisopteryx vernata*. Abundance of Geometrid Larvæ. The Apple-leaf Bucculatrix. The Clover-seed Midge—*Cecidomyia leguminicola Lintn.* The Hessian-fly—*Cecidomyia destructor Say*. *Sciara* sp.? Occurring on Wheat. The Cabbage-fly—*Anthomyia brassicæ Bouché*. A Lady-bug Attack on Scale-Insects. The Carpet Beetle—*Anthrenus scrophulariæ (Linn.)*. The Oak-pruner—*Elaphidion parallelum Newm.* Oviposition of *Saperda candida Fabr.* *Orthaltica copalina (Fabr.)*. The Clover-leaf Weevil Destroyed by a Fungus Attack. *Pœilocapsus lineatus (Fabr.)* Attack on Young Pears by a Plant-bug. An Experiment with the Thirteen-year Cicada. White Scale-insect Attack on Ivy—*Aspidiotus nerii Bouché*. The Black-knot of the Plum tree and its Guests. Collections in the Adirondack Region, et al. Collections in the Adirondack Region in 1885. ACARINA AND MYRIOPODA. A Mite Attack on Garden Plants. A Parasitic Mite of a Sexton Beetle. A Parasitic Attack on the Colorado Potato-beetle. The Cheese-mite Infesting Smoked Meats—*Tyroglyphus siro (Linn.)*. The Cheese-mite Infesting Flour. Food of *Cermatia forceps (Raf.)*. *Julus cæruleocinctus* beneath carpets. APPENDIX: (A.) LIST OF PUBLICATIONS OF THE ENTOMOLOGIST. (B.) CONTRIBUTIONS TO THE DEPARTMENT. GENERAL INDEX. PLANT INDEX.

The Bean Weevil. (New England Homestead, December 21, 1889, xxiii, p. 425, c. 2, 3—9 cm.).

As this is usually a local insect, perhaps the best way to meet it is, by general agreement, to refrain from planting beans in an infested district for a year or two, when the beetles, not flying far for oviposition, would die without progeny. When occurring within beans, they may be killed by dropping the beans for a quarter of a minute in hot water, or by subjecting them, in a tight vessel, to the vapor of bisulphide of carbon (directions given).

PUBLICATIONS OF THE ENTOMOLOGIST DURING THE YEARS 1880 AND 1881.

The Pickled-Fruit Fly — *Drosophila Ampelophila*. (Country Gentleman, for January 1, 1880, xlv, p. 7, c. 3, 4—37 cm.)

Flies taken from decaying peaches are identified and described. Little is known of our *Drosophilas*. Notices of a few are referred to. They vary greatly in their habits. The manner in which pickled fruits in jars become infested, is stated.

Rat-tail Larva of a *Syrphus* Fly. (Country Gentleman, for January 22, 1880, xlv, p. 55, c. 1, 2—18 cm.)

The larvæ taken from decaying mold are described. They belong to the *Syrphidæ*, of which characteristics are given. From the resemblance of the larvæ to figures of *Merodon bardus* they are probably of that species.

[See *Mallota posticata*, *First Report on the Insects of New York*, 1882, pp. 211-216.]

Report on some Injurious Insects of the Year 1878. [An Address delivered at the Annual Meeting of the N. Y. State Agricultural Society, January 22d, 1879.] (38th Annual Report of the N. Y. State Agricultural Society, 1880, pp. 61-72.—Separate, with title-page and cover, pp. 14 [January] 1880.) Also, [in Transactions of the N. Y. State Agricultural Society for the Years 1877-1882, xxxiii, 1884, pp. 97-112.]

Importance of the study of insects in their economic relations: Discovery and description of the larva of the clover-seed fly, *Cecidomyia trifolii* n. sp. [subsequently changed to *leguminicola*] and its injuries: *Anthrenus scrophulariæ* noticed, in its increase and spread, remedies available against it, and its European habits: Sudden multiplication of the flea, *Pulex irritans* in Boston: *Euryomia Inda* operating as a new corn depredator: Description, habits, and natural history of the peach-twig moth, *Anarsia lineatella*, with its attack by a parasite.

Entomology in America in 1879. (American Entomologist, for January and February, 1880, iii, pp. 16-19, 30-34.)

Presidential address before the Entomological Club of the American Association for the Advancement of Science, at its Saratoga meeting, August 26, 1879, giving a review of progress during the year, as shown in the publications (cited) in the several orders, and in special studies conducted.

Poduridæ (Spring-Tails) in a Well. (Country Gentleman, for February 12, 1880, xlv, p. 103, c. 2—15 cm.)

The species, occurring in a well in Massachusetts is identified as *Lipura fimetaria*, the same as those taken from a cistern, and noticed in the *Country Gentleman* of May 22, 1879, where additional information is given of them and of the family to which they pertain.

A New Wheat Pest. (Country Gentleman, for February 19, 1880, xlv, p. 120, c. 2, 3—12 cm.)

The insect occurring in abundance in wheat-fields in Charlotte, N. C., is identified by Mr. P. R. Uhler, as a leaf-hopper, about to be described by him as *Cicadula exitiosa*. Has been known for several years as injurious to wheat in the Southern States.

The Apple Curculio—*Anthonomus Quadrigibbus* Say. (Country Gentleman, for March 4, 1880, xlv, pp. 150, 151, c. 4, 1—28 cm.)

Gives the distribution of the insect, its general appearance, its natural history, and remedies for its ravages.

Worms in Rose Pots—Larvæ of *Bibio Albipennis*. (Country Gentleman, for March 11, 1880, xlv, p. 167, c. 1, 2—36 cm.)

The larvæ, sent from New York, are described, and identified as of the Genus *Bibio*, probably *albipennis*. The features and habits of *B. albipennis* are given. It is believed not to be injurious to vegetation. The robin feeds upon it.

The New Wheat Pest. (Country Gentleman, for March 11, 1880, xlv, p. 167, c. 2—10 cm.)

Until the habits of the insect, *Cicadula exitiosa*, are observed, it will not be possible to say whether it will attack clover sown in wheat-fields about the middle of March, of which inquiry is made.

The Natural History of Bacteria. (Country Gentleman, for March 25, 1880, xlv, pp. 203, 204, c. 4, 1—60 cm.)

The nature of Bacteria; conditions of occurrence, rapidity of multiplication; interest attaching to them as disease germs in splenic fever, typhoid and yellow fever; the bacteria in hog-cholera; Tyndall's experiment showing bacteria germs in common atmosphere, and the destruction of bacteria by disinfectants, and by heat.

The Raspberry Gouty-gall Beetle. (Country Gentleman, for April 1, 1880, xlv, p. 215, c. 1—18 cm.)

In reply to inquiry of the oviposition of this insect, *Agrilus ruficollis* (Fabr.) its natural history is given and method of controlling its injuries. References are made to the principal writings upon it.

[See page 123 of this Report.]

Wheat Insects. (Country Gentleman, for April 15, 1880, xlv, p. 247, c. 2—17 cm.)

Insects attacking wheat in Ohio and in Virginia, are *Siphonophora avenæ* (Fabr.). Its habits are given and its liability to have its threatened multiplication averted by Chalcid parasites, etc.

The Apple-Leaf Bucculatrix. *Bucculatrix Pomifoliella Clemens*. (Country Gentleman, for April 22, 1880, xlv, p. 263, c. 2, 3—36 cm.)

The cocoon of this insect and the caterpillar are described. Its distribution in New York and in the United States; some items in its natural

history; means for its destruction, and reference to writings upon it are given.

[See *First Report Insects of New York*, 1883, pp. 157-162, figs. 41-43.]

Diseased Quince Twigs. (Country Gentleman, for April 22, 1880, xlv, p. 264, c. 2—6 cm.)

Quince twigs are sent from Woodmont, Conn., with supposed attack of a borer at the junction of last season's growth with the old wood. No insect attack is discernable. The appearance is that of the black-knot on plum, and it may be of fungoid origin.

A Poisonous Centipede—*Cermatia Forceps Raf.* (Country Gentleman, for May 13, 1880, xlv, p. 311, c. 2—19 cm.)

The centipede is described—was first observed in Albany in 1870, since which time it has rapidly increased, while in New England it is so rare that mention is made of every example noticed. Notwithstanding its name as above (from Packard), it is believed to be harmless.

[See *Fourth Report on the Insects of New York*, 1888, pp. 128-131.]

The Rose Bug. *Macrodactylus Subspinosus Fabr.* (Country Gentleman, for June 24, 1880, xlv, p. 407, c. 1-3—67 cm.)

Notifies its abundance in the vicinity of Albany, its general features, earliest mention of its ravages, its food-plants, abundance, habits, means of prevention, and remedies for it. A bibliography is appended.

[Extended in *First Report on the Insects of New York*, 1882, pp. 227-232.]

Tallow to preserve Insect Collections. (American Entomologist, for June 1880, iii, pp. 145, 146.)

The odor of tallow repellant to various insects: woolen goods protected from clothes-moth by paper-wrapped tallow-candles placed among them; has been used in entomological collections to protect from *Dermestidae*; experiments with tallow and *Dermestes* larvæ confined in a glass jar.

Carpet Bug. *Anthrenus scrophulariæ* Linn. (Johnson's Natural History, by S. G. Goodrich, ii, 1880, p. 651-2, figs. a-d.)

Its first observation in the State of New York in 1874, and nature of its depredations; its several stages; remedies; introduction from Europe; *Anthrenus lepidus* is a variety.

A Potato Beetle.—*Coptocycla Clavata (Fabr.)* (Country Gentleman, for July 1, 1880, xlv, p. 423, c. 2, 3—18 cm.)

The beetle received from Morristown, N. J., is identified and described. It is not regarded as very injurious to the potato. Its shield of excrements is mentioned. Its early stages have not been described.

[See page 126 of this Report.]

Cut-Worm Moth. (Country Gentleman, for July 1, 1880, xlv, p. 424, c. 1, 2—20 cm.)

Agrotis clandestina Harris, sent for name, is produced from a cut-worm, the habits of which are stated, as also the habits of cut-worm moths, and of this species in particular.

Eggs of Army Worm. (Country Gentleman, for July 1, 1880, xlv, p. 424, c. 2 — 6 cm.)

Eggs contained in frothy matter, attached to blades of grass and edge of clover leaves, received from Erie, Pa., are identified as belonging to *Leucania unipuncta*.

The White Grub Worm — *Lachnosterna Fusca*. *Frohl.* (Country Gentleman, for July 8, 1880, xlv, p. 439, c. 1 — 13 cm.)

Destructive to roots of grass. May exist in numbers without evidence of injury, as in instances upon the capitol grounds at Washington. Plowing for exposing to birds, and pigs for rooting, the best known remedies.

The Hessian Fly. (Country Gentleman, for July 8, 1880, p. 439, c. 1, 2 — 21 cm.)

Straw from Newbern, Va., June sixteenth, with pupæ of this insect. Its abundance at intervals in the United States. Its natural history. Late fall sowing as a preventive, with an earlier sown strip to invite oviposition for the destruction of the eggs. Varieties of wheat less liable to attack, as Clawson, Fultz, etc.

A Leaf Eater. (Country Gentleman, for July 8, 1880, xlv, p. 439, c. 3 — 3 cm.)

Insects appearing in a wheat field in Deposit, N. Y., are identified as the hairy-necked leaf-eater, *Phyllophaga pilisicollis*. Its larvæ are destructive to the roots of grass and other cultivated plants.

[Now known as *Lachnosterna tristis* (Fabr.).]

The Squash Borer. (Country Gentleman, for July 15, 1880, xlv, p. 455, c. 2, 3 — 26 cm.)

Larvæ very destructive to vines in Highland, N. Y., are identified as *Egeria* (*Melittia*) *cucurbitæ* Harris. The features of the moth, its oviposition, larval habits, and means for prevention of attack, are given.

[See *Second Report Insects of New York*, 1885, pp. 57-68, figs. 3-6.]

The Stalk-Borer (*Gortyna nitela*). Guen. (Country Gentleman, for July 22, 1880, xlv, p. 472, c. 1, 2 — 14 cm.)

Reported as injurious to potatoes in Bennington, Vt. Reference to extended notices of the insect, and means for its destruction given. Injures wheat and corn in Western States.

[See *First Report on the Insects of New York*, 1882, pp. 110-116.]

The Striped-blister Beetle — *Epicauta vittata*. (Country Gentleman, for July 29, 1880, xlv, p. 488, c. 1 — 7 cm.)

Received from Cayuga County, N. Y., and said to be more injurious to potatoes than the Colorado beetle. Is at present very abundant about Albany, and reported as destroying a garden in a night. Beating into a pan with kerosene recommended for its destruction.

The Basket-worm — *Thyridopteryx ephemeraeformis*. (Country Gentleman, for August 19, 1880, xlv, p. 535, c. 4—15 cm.)

In reply to information asked of a worm destroying arbor vitæ at Bayside, N. Y., a description of the basket, habits of the contained larva, appearance of the male and female moths, and best method of checking the ravages, by hand-picking, are given.

The Basket or Bag Worm — *Thyridopteryx Ephemeraeformis*. (Country Gentleman, for September 30, 1880, xlv, p. 631, c. 3, 4—17 cm.)

Reported as destroying arbor vitæ hedges in West Brighton, N.Y. Its food-plants mentioned, present stage of the insect, may be destroyed by insecticides during larval growth, but hand-picking preferable.

Caterpillars on the Ampelopsis. (Country Gentleman, for October 7, 1880, xlv, p. 647, c. 2, 3—16 cm.)

The moths of the two blue caterpillars of which inquiry is made, are *Athypia octomaculata* and *Eudryas grata*. If the vines attacked by the larvæ are not too large, they may be hand-picked; if quite large the caterpillars may be killed by showering with hot water from a garden hose.

[See *Fifth Report on the Insects of New York*, 1889, pp. 37-41.]

The Harlequin Cabbage-Bug — *Murgantia histrionica* (Hahn.). (Country Gentleman, for October 21, 1880, xlv, p. 679, c. 1-3—81 cm.)

A description of the insect is given, followed by its distribution from Texas northward; its present range and probable future extension; its history; difficulty of killing by means usually employed against insects; the most efficient remedies; freedom from parasitic attack, and citation of its literature.

[Extended in *First Report on the Insects of New York*, 1882, pp. 264-271, f. 77.]

The Two-Spotted Tree Hopper — *Enchophyllum Binotatum*. (Country Gentleman, for November 4, 1880, xlv, p. 711, c. 1-3—47 cm.)

In reply to inquiries made, the cocoon-like forms on twigs are identified as egg coverings of the above-named insect. The insect, its eggs, and transformations are described, the plants upon which it occurs are named, and the means for preventing its injuries stated.

[Extended in the *First Report on the Insects of New York*, 1882, pp. 281-288, figs. 79-84.]

Flour-Paste Flies. (Country Gentleman, for November 18, 1880, xlv, p. 743, c. 2—12 cm.)

Flies bred from flour-paste are found to be a species of *Drosophila*. The features of the pupa-cases and the flies are given. They differ from *D. ampelophilæ*.

[See page 116 of this Report.]

Lepidoptera of the Adirondack Region. Collected by W. W. Hill in 1875-1878. (Seventh Annual Report on the Progress of the Topographical Survey of the Adirondack Region of New York, by Verplanck Colvin, Albany, 1880, pp. 375-400. Separate, with title-page and cover [November], 1880, pp. 375-400.)

Records 415 species collected, with sexes and dates of collection. Remarks upon the method of sugaring employed; proportion of the sexes tabulated: rare and new species; sub-arctic character of some of the species; successful collection of *Plusias*; *Plusias* at sugar and at flowers; local lists of Lepidoptera published.

Report on some Injurious Insects of the Year 1879. [Presented to the N. Y. State Agricultural Society at its annual meeting, January 21, 1880.] (Thirty-ninth Annual Report of the N. Y. State Agricultural Society, 1880, pp. 35-55.) Also [in Transactions of the N. Y. State Agricultural Society for 1877-1882, xxxiii, 1884, pp. 142-164, figs. 4].

After prefatory remarks on the progress and present position of economic entomology in the United States, the following insects are discussed: the clover-seed midge, *Cecidomyia leguminicola* Lintn., p. 144; the clover-root borer, *Hylesinus trifolii* Müll., with figures, p. 148; the wheat-stem maggot, *Meromyza Americana* Fitch, p. 150; the corn curculio, *Sphenophorus zea* Walsh, with figures, p. 154; the stalk-borer, *Gortyna nitela* Guenée with figures, p. 157; the apple-tree case-bearer, *Coleophora malivorella* Riley, with figures, p. 161; concluding with a notice (p. 163) of the entomological labors of Dr. Asa Fitch, whose death had occurred during the year (April 8, 1879).

[Address before the Farmers' Club of Onondago county, N. Y., December 4, 1880.] (Syracuse Morning Standard, for December 6, 1880; p. 4, c. 2, 3, 4 — 129 cm.)

The magnitude of agricultural interests; importance of entomological investigations; progress made in entomological study; its absolute necessity; causes for increase in insect ravages; promoted by cultivation of crops in large areas; increase of apple insects; why it is necessary to contend with insect pests; how they may be best controlled; how economic entomology may be promoted; its study in schools; aid that legislation may extend; what the general government and the State have already done.

The Bean Weevil — *Bruchus Fabæ*. (Country Gentleman, for January 6, 1881, xlv, p. 7, c. 2 — 12 cm.)

Field and garden beans from Northampton, Mass., are infested with the above insect—its first appearance in this locality in forty years' experience. It was noticed about twenty years previously in some of the New England States; is now common in New York, and is extending over the Western States. As it may easily be distributed in planting

infested beans — if seed beans are kept tied tightly up in bags until the second year they will contain no living insects, and may then be safely planted.

A Flight of Ephemera. (Country Gentleman, for January 6, 1881, xlv, p. 7, c. 2, 3—22 cm.)

Remarkable flights of insects (accounts quoted) in 1879 and 1880 in Essex Co., Va., and in the present year when "they were followed by millions of swallows," are recognized from the descriptions given as some species of ephemera or "day-fly." The *Ephemeridæ* are often abundant near lakes and rivers, as in instances stated; their larvæ (aquatic) live two or three years, and the imago of some species two weeks; are favorite food for fishes. About 200 species are known.

On the Importance of Entomological Studies. (Papilio for January 15, 1881, i, p. 1, 2.)

Shown in the literature of entomology, the scientists engaged in the study, and the aid extended to it by the States and General Government. Is of greater importance in this country than elsewhere, from the abundance of agricultural products, and the extensive scale on which they are cultivated inviting and promoting insect attack.

Description of a New Species of Eudamus. (Canadian Entomologist for April, 1881, xiii, pp. 63-65.) Republished in [First Annual Report on the Injurious and other Insects of the State of New York, 1882, pp. 338, 339].

Describes *Eudamus Electra*, from an example captured in Hamilton, Ontario. Noticed as an interesting discovery for this portion of North America.

The Asparagus Beetle — *Crioceris Asparagi* (Linn.). (Country Gentleman, for April 14, 1881, xlv, p. 243, c. 1-3—70 cm.)

History of the insect from its appearance on Long Island in 1859; Dr. Fitch's writings on it; attacked by a parasite; its distribution of about twenty miles a year; the beetle described; characters of the *Chrysomelidæ*, to which it belongs; transformations of the insect. Remedies are, employing fowls to hunt them and cutting down the young seedlings. Mr. Fuller's lime remedy deemed the best; bibliography of the species.

[Extended in the *First Report on the Insects of New York*, 1882, pp. 239-246.]

The Army Worm. The Invasion of Northern New York by this Destructive Pest. (Albany Evening Journal, for May 23, 1881, p. 3, c. 1—46 cm. Country Gentleman, for June 2, 1881, xlv, p. 359, c. 1, 2—46 cm.)

Recent reports published of the invasion not exaggerated, as appears from personal observations made. Its observed extent is given and nature of attack on pasture lands and meadows. Not positively identi-

fied as the army-worm; no marches observed; may prove a new depredator; promises to be more destructive later; recommendations made for the arrest of the injuries.

[See *First Report on the Insects of New York*, 1882, pp. 127-149.]

On Some Species of Nisoniades. (*Papilio*, for May, 1881, i, pp. 69-74. Separate, June, 1881, pp. 1-6.) Republished in [First Annual Report on the Injurious and Other Insects of the State of New York, 1882, pp. 333-337].

Describes *Nisoniades Nævius*, *N. Petronius*, and *N. Somnius* as new species, and gives comparative notes on *N. Propertius*, *N. Juvenalis*, and *N. Icelus*. Remarks on a tibial hair-pencil in several species. Claims as a good species *Eudamus Nevada*, and notes the occurrence in New York of *Eudamus Proteus*.

The "Army Worm" Invasion of Northern New York. (St. Lawrence Republican, for June 8, 1881, li, cols. 7, 8, 9—197 cm.)

Notice of the operations of the caterpillars—not like those of the army-worm; their assemblage on an oak; habits of the army-worm, and how it may be controlled; description of the larvæ seen; secrecy of the attack; some of the larvæ identified as *Nephelodes violans* Guenée; the present abundance very remarkable; speculations on its reappearance another year.

A New Insect [Pest]—Not the Army Worm. (Country Gentleman, for June 9, 1881, xlvi, p. 375, c. 1—23 cm.)

The insect in Northern New York supposed at first to be the army-worm, is *Nephelodes violans* Guenée, which had never before been known as injurious. Its injuries are now decreasing, and there will not be a second brood the present year.

Insects on Plum Trees. (Country Gentleman, for June 9, 1881, xlvi, p. 376, c. 2—10 cm.)

The insects identified—none are injurious. *Bibio femoratus*? sent is harmless. The plum curculio also attacks the cherry.

Mites in Clothing. (Country Gentleman, for June 9, 1881, xlvi, p. 376, c. 2—7 cm.)

A box of clothing in a seldom-used chamber in Susquehanna county, Pa., was found infested with mites; the walls, floor and furniture near it were almost covered with them. The species was not identified, but was apparently allied to *Tetranychus telarius*. They could be destroyed with powdered sulphur or Persian insect powder.

[The mite was probably *Bryobia pratensis*: See p. 158 of this Report.]

The Late Insect Invaders of Northern New York. (Albany Evening Journal, for July 1, 1881—42 cm.)

Some of the larvæ collected at Potsdam have been identified as *Nephelodes violans* Guenée. From other collections one example of

Crambus ersiccatus Zeller has been reared. Cocoons collected from a locality where the injuries are severe, are those of a Pyralid, which was probably the chief depredator. Remarks are added on the *Crambidae*.

The Orchard Caterpillar. (Country Gentleman, for July 14, 1881, xlv, p. 455, c. 3—10 cm.)

A cocoon from a deserted nest of *Clisiocampa Americana*, is of that species. A few of the caterpillars occasionally spin up within the nest, instead of elsewhere; as is the rule.

Worms on Tomatoes. (Country Gentleman, for July 14, 1881, xlv, p. 456, c. 3—5 cm.)

The "light-brown worm or fly," reported from Newark, N. J., as cutting away every tomato blossom two or three days after opening, can not be named without examples of the insect.

Pear-tree Blight. (Middleburgh Gazette, for July —, 1881—25 cm.)

An apparent blight is sometimes caused by insect attack, but the true pear-tree blight is always associated with bacteria in the circulation, and is believed to be occasioned by their presence. The best methods of dealing with the disease are given.

Insects and Fungus on Quinces. (Country Gentleman, for August 18, 1881, xlv, p. 535, c. 1, 2—75 cm.)

Quinces from South Byron, N. Y., the crop of which has been nearly destroyed, contain the larvæ of the quince curculio (*Conotrachelus crataegi* Walsh), and of the apple-worm (*Carpocapsa pomonella* Linn.). The former, more abundant, is described, its habits given, its destructiveness to quinces, and the available remedies. The fungus associated with the insect attack is *Roestelia aurantiaca*—a common association. Notes on the fungus are given. Some dipterous larvæ feeding on the fungus spores are described. The fruit and twigs showing the attack should be burned.

An Insect Pest. Preservation of our shade trees from its ravages. (Albany Evening Journal, for August 31, 1881—32 cm.)

The cotton bands observed about trees to protect from the caterpillar of the white-marked tussock-moth, *Orgyia leucostigma*, can only give protection if the trees are previously free from eggs or the larvæ, otherwise they may be harmful. The only effectual preventive is the destruction of the eggs, for which instructions are given. Recommendations are that each householder should remove the egg-masses from trees on his premises, and that the city authorities should require it. Destroy only the cocoons that bear the egg-masses. Make later search for the eggs when the trees are leafless.

Insects on Strawberry Roots. (Country Gentleman, for September 8, 1881, xlv, p. 583, c. 1, 2—8 cm.)

To an inquiry from Richmond, Mass., of an insect abounding on strawberry roots, "dark-green and half as large as a pin's head," reply is made of inability to name it without examples:

Apple Leaf Cluster Cup Fungus. (Country Gentleman, for September 8, 1881, xlv, p. 583, c. 2—10 cm.)

Leaves from Orange, N. J., are infested with this fungus, *Ecidium pyratum* Schw. Was first observed on wild crab. Has killed trees in Ohio and Tennessee. May be arrested by plucking leaves and cutting off boughs first infested, and burning. Characters of the fungus.

Beetle on the Tomato. (Country Gentleman, for September 8, 1881, xlv, p. 584, c. 3—14 cm.)

Beetles from Canton, Ga., very destructive to the leaves of tomato vines are the ash-gray blister-beetle, *Epicantha cinerea* (Forster). It is common on the potato, but not previously reported on the tomato. Best remedy is to beat them into a pan with kerosene and water.

[See page 134 of this Report.]

Crambus vulgivagellus in Northern New York. (St. Lawrence Republican, for September 14, 1881.)

It is this species that has caused most of the destruction to grass-lands, and not *Nephelodes violans* as at first supposed. Its cocoons and the moths obtained therefrom are described. The moths are now emerging in the infested fields. The insect has never before been recorded as injurious.

Injurious Insects, with Special Notice of some New Insect Pests. [Read before the New York State Agricultural Society, at Elmira, September 13, 1881.] (The Husbandman [Elmira, N. Y.], for September 14, 1881, pp. 3, 6, 7—5 cols. Country Gentleman, for September 29, 1881, xlv, p. 631, c. 2, 3—56 cm.; id. for October 6, 1881, p. 647, c. 1-3—52 cm.) Republished in (Forty-first Annual Report of the New York State Agricultural Society, for the year 1881. Albany [August], 1882, pp. 40-50. Transactions of the New York State Agricultural Society, xxxiii, for 1877—1882. 1884, pp. 221-234.)

Discusses the province of the Economic Entomologist; gives the history of the appearance of the Vagabond Crambus, *Crambus vulgivagellus* Clemens, in Northern New York; notices the punctured clover-leaf weevil, *Phytonomus punctatus* (Fabr.), and the Pyralid web-caterpillar, *Eurycreon rantis* Guen.; with remarks on the progress recently made in Economic Entomology.

The Vagabond Crambus. (Ogdensburgh [N. Y.] Daily Journal, for September 21, 1881.—18 cm.)

The above popular name is proposed for the *Crambus vulgivagellus*, recently so destructive. Possibility of a second brood considered. Scattering ashes or plaster over the grass-lands the present month, recommended as a preventive of further injuries.

Grass Eating Grub. (Country Gentleman, for September 22, 1881, xlv, p. 615, c. 2—14 cm.)

A grub destroying grass roots in Pownal, Vt., so that the whole turf can be raked off, and at Warrensburgh, N. Y., to the extent that the sod can be rolled up like a mat, is the white grub, *Lachnosterna fusca*. The insect is difficult to destroy. Relief may be had in plowing and exposing the grubs to birds and its other enemies, and in allowing hogs to root them out. In May and June the beetle may be shaken from trees and killed.

A Barn Beetle—*Lathridius pulicarius*. (Country Gentleman, for September 29, 1881, xlv, p. 632, c. 2—11 cm.)

A beetle, identified as *Lathridius pulicarius*, is received from Westogue, Conn., where it is infesting a barn—on grain bags, a package of tobacco, and “overrunning everything.” Little is known of the habits of this beetle. It is not regarded as injurious to any crop, and its abundance in the barn can not be accounted for.

A Remarkable Invasion of Northern New York by a Pyralid Insect, *Crambus vulgivagellus*. [Abstract of a Paper read before the American Association for the Advancement of Science, at its Cincinnati Meeting, in August, 1881.] (Science, for October 1, 1881, ii, p. 467. Proceedings of the American Association for the Advancement of Science, xxx, for 1881, pp. 267, 268.)

Gives the principal features of the recent remarkable abundance of this insect and its injuries.

A Peach Pest—*Largus Succinetus*. (Country Gentleman, for October 13, 1881, xlv, p. 663, c. 1, 2—29 cm.)

A bug attacking nearly ripened peaches is the above-named species. Its principal features are given. It has not previously been recorded as injurious to fruit. The southern cotton-stainer, *Pyrrhocoris* [*Dysdercus*] *suturellus*, is allied to it. Its injuries to peaches can only be prevented by killing it; it might be attracted to refuse sugar cane or cotton seeds, as is the cotton-stainer, and then killed with hot water.

[A more extended notice in the *Second Report on the Insects of New York*, 1885, pp. 164-167.]

Insect Enemies of the Strawberry. (Country Gentleman, for October 27, 1881, xlv, p. 695, c. 2, 3—39 cm.)

Strawberry leaves badly eaten (as described) are received from Lewisburg, Pa. The injury can not be referred to any known strawberry pest. It was not the work apparently of the strawberry worm. The principal strawberry insects are mentioned, viz., the white grub, the goldsmith beetle (*Cotalpa lanigera*), *Allorhina nitida*, the grapevine Colaspis, the strawberry crown borer, and the strawberry aphid. The depredator may prove to be *Paria aterrima* Oliv.

The Insects of the Clover Plant. [Read before the New York State Agricultural Society, at its annual meeting, January 19, 1881.] (Fortieth Annual Report of the New York State Agricultural Society, for the year 1880, pp. 10-26, figs. 1-6. 1881. Separate, with t. p. cover, pp. 17, figs. 6 [October] 1881.) Republished in [Transactions of the New York State Agricultural Society, for 1877-1882, xxxiii, pp. 187-207. 1884.]

Remarks on the value of the clover plant as a fertilizer, and on the increase of insect depredations on clover. Lists of European clover insect depredators, and of those known in this country are given. Of the latter a few are noticed in detail and illustrations given, viz.: the clover-root borer, *Languria Mozardi* Latr.; the clover-seed midge, *Cecidomyia leguminicola* Lintn.; the clover-leaf midge *Cecidomyia trifolii* Loew; and the clover Oscinis, *Oscinis trifolii* Burgess.

On the Life Duration of the Heterocera (Moths). [Read before the American Association for the Advancement of Science, at its Cincinnati meeting, August, 1881.] (Canadian Entomologist, for November, 1881, xiii, p. 218-220.) Republished in [First Annual Report on the Insects of New York, 1882, pp. 339-341.]

But little attention has been given to the subject, as it is difficult of investigation. The *Noctuidæ* especially have been little observed. The *Attacinae* of the *Bombycidae* have brief lives—the *Sphingidae* somewhat longer. In the *Noctuidæ* it varies much. In *Xylina*, *Homoptera*, and *Catocala*, it may reach two months, and through hibernation, six additional months. The approximate life duration of the Noctuid moths is probably about three weeks.

The Corn Beetle. (Country Gentleman, for November 3, 1881, xlv, p. 711, c. 1, 2—18 cm.)

A beetle feeding on corn just from the field, in Acton, Mass., is identical with the species determined [by Dr. LeConte] as *Lathridius pulicarius* [see page 183], but possibly an error has occurred in the determination. The injuries to the corn sent can not be due wholly to the insect, which appears not to attack whole kernels, but only such as had been previously broken.

The Cabbage Plusia.—*Plusia Brassicæ* Riley. (Country Gentleman, for November 3, 1881, xlv, p. 711, c. 2, 3—41 cm.)

The insect, in different stages, is received from Dover, N. J., where the larvæ are reported as destructive to cabbage and Swede turnips, and the moths as ovipositing soon after sunset. The larva, pupa, and moth are described, with mention of the larval food-plants, injuries from the insect in the Southern States, its recent multiplication for the first in New York, its resemblance to *Plusia ni*, of Europe, and its two annual broods. As remedies, hand-picking, hot water and pyrethrum in powder or water are recommended. The bibliography of the species is given.

[Extended in *Second Report on the Insects of New York*, 1885, pp. 89-93.]

On the Life Duration of the Heterocera (Moths). [Abstract of a paper read before the A. A. A. S. at its Cincinnati meeting in August, 1881.] (Science for November 5, 1881, ii, p. 525. Proceedings of the A. A. A. S., xxx, for 1881, p. 268, 269.)

A summary of contents of the paper given on the preceding page may also serve for that of this abstract.

The Corn Worm — *Heliothis Armigera* *Hüb.* (Country Gentleman, for November 24, 1881, p. 759, c. 2, 3—51 cm. The Ontario County Times, for November 24, 1881, xxxi, p. 3, c. 5—59 cm.)

Corn in the husk with the attacking insect, from South Bristol, N. Y., indicates a formidable attack of the corn-worm, *Heliothis armigera*, which had never before been known as injurious in New York. Its injuries in Southern and Western States, and in the vicinity of Albany, its feeding habits, description of the caterpillar and moth, are given. It probably will not continue its injuries in New York in following years.

Habits of the Phylloxera. (Country Gentleman, for December 1, 1881, xlv, p. 779, c.1—20 cm.)

In reply to inquiry from West Orange, N. J., of the Phylloxera mite found in galls on grapevine leaves, the gall-inhabiting form, type *gallicola* and the eggs are described, and reference made to Prof. Riley's Missouri Reports for the full history of the species.

The Bean Weevil — *Bruchus Obsoletus* (Say). (Country Gentleman, for December 8, 1881, xlv, p. 795, c.1, 2—48 cm.)

The above-named insect reported from Sherman, Conn., as a new pest, is identical, according to Dr. Horn, with the *Bruchus fabæ* of Riley; is compared with *B. pisi*; its increase and present distribution. For preventives, cease growing beans for a year or two, or tie up in bags in which the beetles may die, or throw in hot water for a minute or two. Notice of the European *B. granarius*. Literature of *B. obsoletus*.

(B.)

CONTRIBUTIONS TO THE DEPARTMENT.

The following are the contributions that have been made to the Department during the year 1889:

IN HYMENOPTERA.

Cells of the leaf-cutter, *Megachile* sp., in burrows in black ash from a swamp at Manchester, N. Y. From Dr. PETER COLLIER, N. Y. St. Agricultural Experiment Station, at Geneva.

A cluster of *Eulophus* pupa-cases. From Mrs. E. W. K. LASELL, Orange, N. J.

Semiotellus clisiocampæ (Fitch) from cocoons of *Clisiocampa sylvatica* Harris. From T. E. CROSS, Kingsbury, Washington Co., N. Y.

Larvæ of *Harpiphorus varianus* Norton, feeding on *Cornus stolonifera*. A jumping cocoon — unknown. From M. W. VANDENBERG, M. D., Fort Edward, N. Y.

Thalessa lunator (Fabr.), from a maple. From CLARA WILLIAMS, Meridian, N. Y.

IN LEPIDOPTERA.

Sixty-four examples of butterflies and two of moths, from South America, viz.:

Papilio Thyastes Drury. 4.
P. Agesilaus Pesth. 3.
P. Proteus Boisd.
P. Ajax Linn.
P. Vertumnus Cram.
P. Sesostrius Cram.
P. Cresphontes Cram. 5.
P. Ajax Linn.
? *Pieris* sp.
Catopsilia menille.
C. Argante Fabr. 2.
C. Eubele Linn.
C. sp. ?
Ageronia feronea Hübn.
A. fornax Hübn.
Heliconia Rhea.

Heliconia Melpomene Linn. 2.
Thyridia psidii Cram. 3.
Ithomyia sao Hübn.
I. sp. ?
Coloenis Dido Linn. 3.
Agraulis vanillæ Linn.
Anartia Amalthea Linn.
Catagramma peristera Hew. 4.
C. sorana v. *Latona*.
C. sp. ?
Epicalia sp. ?
Aganisthos Orion Fabr. 3.
Megistanis Deucalion Feld.
M. Bæotus Boisd. 3.
Morpho sp.
? *Limenitis* sp.

*The determinations accompanying, have not been verified.

Stalactis phlegea Cram.
Batesia pygola Drury.
Thecla Marsyas Linn.
Eudamus Catillus Cram.

Telegonus Mercator Fabr.
Pyrrhophaga Acastus Cram.
P. *Phidias* Linn.
Esthena bicolor. 2.

Fifty-two examples of Lepidoptera from New York State, viz.:

Papilio Asterias Fabr. 2.
Papilio Philenor Linn.
Papilio Troilus Linn.
Colias Philodice Godt. 2.
Euptoieta Claudia (Cramer).

Pyrameis huntera (Fabr.). 2.
Pyrameis cardui (Linn.). 2.
Junonia coenia (Boisd.). 2.
Deilephila lineata (Fabr.)
Homoptera lunata Drury. 3.

Other *Noctuidæ*, 8 examples; *Hypenidæ*, 9 examples; *Geometridæ*, 6 examples; *Pyralidæ*, 11 examples; *Tineidæ*, 1 example. From ERASTUS CORNING, JR., Albany, N. Y.

Larva of *Papilio Philenor* Linn., feeding on *Aristolochia siphon*, and its chrysalis, July 25th. Eggs of *Grapta interrogationis* (Fabr.), June 20th. From Mrs. E. W. K. LASELL, Orange, N. J.

Pupa of *Sphinx quinquemaculata* Steph. From JOHN HENRY, East Worcester, N. Y.

Larva of *Thyreus Abbotii* Swainson. From JACOB H. HOUCK, Central Bridge, N. Y. The same, from CHARLES H. RAMSEY, Howes Cave, N. Y.

Melittia cucurbitæ (Harris), ♂ and ♀, June 24th. From Prof. C. H. PECK, Albany, N. Y. The same, four examples, taken July 20th and August 3d. From H. VAN SLYKE, Coxsackie, N. Y.

A colony of young larvæ of *Halisidota caryæ* (Harris), feeding on cherry leaves, July 22d. From IRA W. HOAG, Pawling, N. Y.

Larva of the "saddle-back," *Empretia stimulea* Clemens, from corn, August 24th. From Mrs. E. W. K. LASELL, Orange, N. J.

Cases of *Thyridopteryx ephemeraformis* (Haworth). From M. W. VANDENBERG, Fort Edward, N. Y. The same, and eggs of *Hyperchiria Io* (Fabr.) from Mrs. E. W. K. LASELL, Orange, N. J.

Larvæ of *Cacæcia rosaceana* (Harris), eating into pear-buds, May 22d. From W. P. RUPERT & SONS, Seneca, N. Y.

"Jumping-seeds" containing larvæ of *Carpocapsa saltitans* Westw., September 25th, obtained from the U. S. Consul at Guaymas, Sonora, Mexico. From W. E. WALSH, Benson, Arizona.

Apple leaves containing the larvæ of *Tischeria malifoliella* Clemens, September 10th. From Prof. C. H. PECK, Albany, N. Y.

Wheat infested with the Angoumois moth, *Sitotroga cerealella* Oliv., and abounding with the remains of *Heteropus ventricosus* Newport. From L. S. MACON, Charlottesville, Va.

Cocoons of *Bucculatrix pomifoliella* Clemens. From Prof. C. H. PECK, Menands, N. Y. The same, from W. J. STRICKLAND, Albion, N. Y.

Cases of *Tinea pellionella* Linn., containing the larvæ, November 15th. From H. C. COON, M. D., Alfred Centre, N. Y.

IN DIPTERA.

Larvæ and imagines of *Sciara* sp. from mushroom beds, March 20th. From CHARLES ELLERY, Albany, N. Y. The same, May 7th, from WILLIAM FALCONER, Glen Cove, N. Y.

Bibio albipennis Say, from apple-trees. From J. C. WHITEHILL, Meadsville, Pa.

Eristalis tenax (Linn.), several examples. From Mrs. E. B. SMITH, Coeymans, N. Y.

IN COLEOPTERA.

Hydrophilus triangularis Say, living, October 21st. From CHARLES SCHWARTZ, Albany, N. Y.

Silvanus Surinamensis (Linn.) infesting a dwelling-house. From HENRY HANSON, Catskill, N. Y.

Dermestes lardarius Linn. From J. M. ADAMS, Watertown, N. Y.

Anthrenus scrophulariæ Linn., and *Attagenus piceus* (Oliv.). From Mrs. E. B. SMITH, Coeymans, N. Y.

Ips fasciatus Oliv., several examples, July 4th, eating into squash vines. From Prof. C. H. PECK, Menands, N. Y.

Limonius confusor Lec., feeding on quince blossoms, May 20th. From A. H. BRIGGS, Macedon, N. Y.

Larvæ, pupæ, and imagines of *Ptinus quadrimaculatus* Melsh., in green calf-skins, January 23d. From GEORGE H. THOMAS & Co., Middleville, N. Y.

Ptinus brunneus Duft., from the herbarium of Middlebury College. From Prof. HENRY M. SEELY, Middlebury, Vt.

Neoclytus erythrocephalus (Fabr.), from *Xyleborus* infested pear twigs, February 11th. From NORMAN POMROY, Lockport, N. Y.

Desmocerus palliatus (Forst.), June 15th. From Mrs. E. W. K. LASELL, Orange, N. J.

Monohammus confusor (Kirby), emerged from a painted floor, July 2d. From CHAS. H. RAMSEY, Howes Cave, N. Y.

Hyperplatys maculatus Hald. From Prof. C. H. PECK, Albany, N. Y.

Crioceris asparagi (Linn.), June 8th. From A. S. PLYMPTON, Hartford, Conn. The same, from AUGUSTUS FLOYD, Moriches, N. Y.

Paria aterrima (Oliv.), from strawberry plants, August 27th. From A. W. CHEEVER, Dedham, Mass.

Galeruca xanthomelaena (Schränk.). From A. L. BROWN, M. D., Cornwall-on-Hudson, N. Y.

Larvæ of *Haltica chalybea* Illig., infesting grape-vines, June 19th. From GEORGE C. SNOW, Penn Yan, N. Y.

Chelymorpha Argus Licht., feeding on the leaves of pea-vines, July 22d. From PETER HENDERSON, New York city.

Nyctobates Pennsylvanica De Geer, and *Alaus oculatus* Linn. From DAVID CROUSE, Summit, N. Y.

Otiiorhynchus ovatus (Linn.), from strawberry plants, August 27th. From A. W. CHEEVER, Dedham, Mass. The same, as a pest in dwellings. From Miss A. CLARKSON, Potsdam, N. Y.

Calandra granaria Linn., infesting seed-corn. From Mr. A. DOWD, Utica, N. Y.

IN HEMIPTERA.

Podisus modestus (Dallas) larva, June 26th, preying on larvæ of *Haltica chalybea*. From GEORGE C. SNOW, Branchport, N. Y.

Lygus (lineolaris) Pal. Beauv.) pratensis Linn., August 6th, feeding on the tobacco plant. From C. R. HOYT, Osceola, Tioga Co., N. Y.

Emesa longipes De Geer, Sept. 13th. From JOHN ASPINWALL, West Brighton, L. I., N. Y. The same, from Mrs. E. B. SMITH, Coeymans, N. Y.

Belostoma Americanum Leidy, April 18th. From C. N. PRINDLE, Johnstown, N. Y. The same, September 11th. From Prof. RALPH W. THOMAS, Albany, N. Y.

Cicada tibicen Linn. From Mrs. E. B. SMITH, Coeymans, N. Y.

Siphonophora avenæ (Fabr.), on wheat, June 1st. From A. HERSHOG, Allendale, Ill. The same, from R. ELLISON, LaGrange, Ill. The same, from C. C. HARDENBERG, Stone Ridge, N. Y.

Melanozanthus sp. ? feeding on *Celastrus scandens*, September 3d. From M. W. VANDENBERG, M. D., Fort Edward, N. Y.

Galls of *Phylloxera depressa* (Shimer) on hickory leaves, June 24th. From C. H. RAMSEY, Howes Cave, N. Y.

Gossyparia ulmi Geoffroy, a coccus on *Ulmus fulva*, at Marlborough, N. Y., July 6th, 1888. (See L. O. Howard, in *Insect Life*, ii, 1889, pp. 34-41, figs. 1-8, on this species.) From Prof. C. H. PECK, Albany, N. Y.

IN ORTHOPTERA.

Æcanthus niveus Harris, *Æcanthus fasciatus* De Geer, and eggs of the latter in raspberry and snowball (*Viburnum opulus*). From E. A. ALLIS, Adrian, Mich.

Cyrtophyllus concavus (Harris) and *Phylloptera oblongifolia* De Geer. From Mrs. E. B. SMITH, Coeymans, N. Y.

The "walking-stick," *Diapheromera femorata* (Say). From JONAS H. BROOKS, Albany, N. Y.

IN NEUROPTERA.

Stone caddis-cases of *Limnephilidae*. From LEROY C. WING, Glens Falls, N. Y. Cases of the same, with living larvæ, May 16th. From CHARLES S. WILLIAMS, Glens Falls, N. Y.

IN THYSANURA.

Isotoma albella Packard, from a filter of Albany city water, February 16th. From JOSEPH H. BLATNER, M. D., Albany.

Lepisma ?domestica Packard, eating laces and paper boxes. From MERWIN & HOLMES, Peekskill, N. Y.

IN —————?

Currant stems girdled by "the currant stem girdler" (insect unknown). From A. H. BRIGGS, Macedon, N. Y.

Twigs of Canadian poplar bored by an unknown larva. From ELLWANGER AND BARRY, Rochester, N. Y.

IN ARACHNIDA.

"The mule-killer," or "the nigger-killer," *Thelyphonus giganteus* Latr. From W. E. WALSH, Benson, Arizona.

Chernes Sanborni Hagen, two examples from the legs of a fly, July 1st — sp? unknown (not sent). From CHARLES L. WILLIAMS, Belleville, N. Y. The same, August, from legs of *Xylotrechus*. From Mr. POLAND, Beedes, Essex county, N. Y.

Uropoda Americana Riley, infesting and killing the Colorado potato beetle, May 16th. From SILAS L. ALBERTSON, Roslyn, N. Y.

Tyroglyphus longior Gervais, infesting horse-collars and a carriage-house, July 12th. From ROBERT C. PRUYN, Albany, N. Y.

Heteropus ventricosus Newport, in association with the larvæ of *Sitotroga cerealella* Oliv., in wheat. From L. S. MACON, Charlottesville, Va.

Trichodectes sphærocephalus Nitzsch, infesting the wool of sheep. From J. P. CHAMPLIN, North Blenheim, N. Y.

IN MYRIOPODA.

Scolopendra sp. ? From W. E. WALSH, Benson, Arizona.

Cermatia forceps Raf. From J. C. BISSELL, Rome, N. Y.

Julus cæruleocinctus Wood, from cabbage roots. From F. N. TILLINGHAST, Greenport, N. Y.

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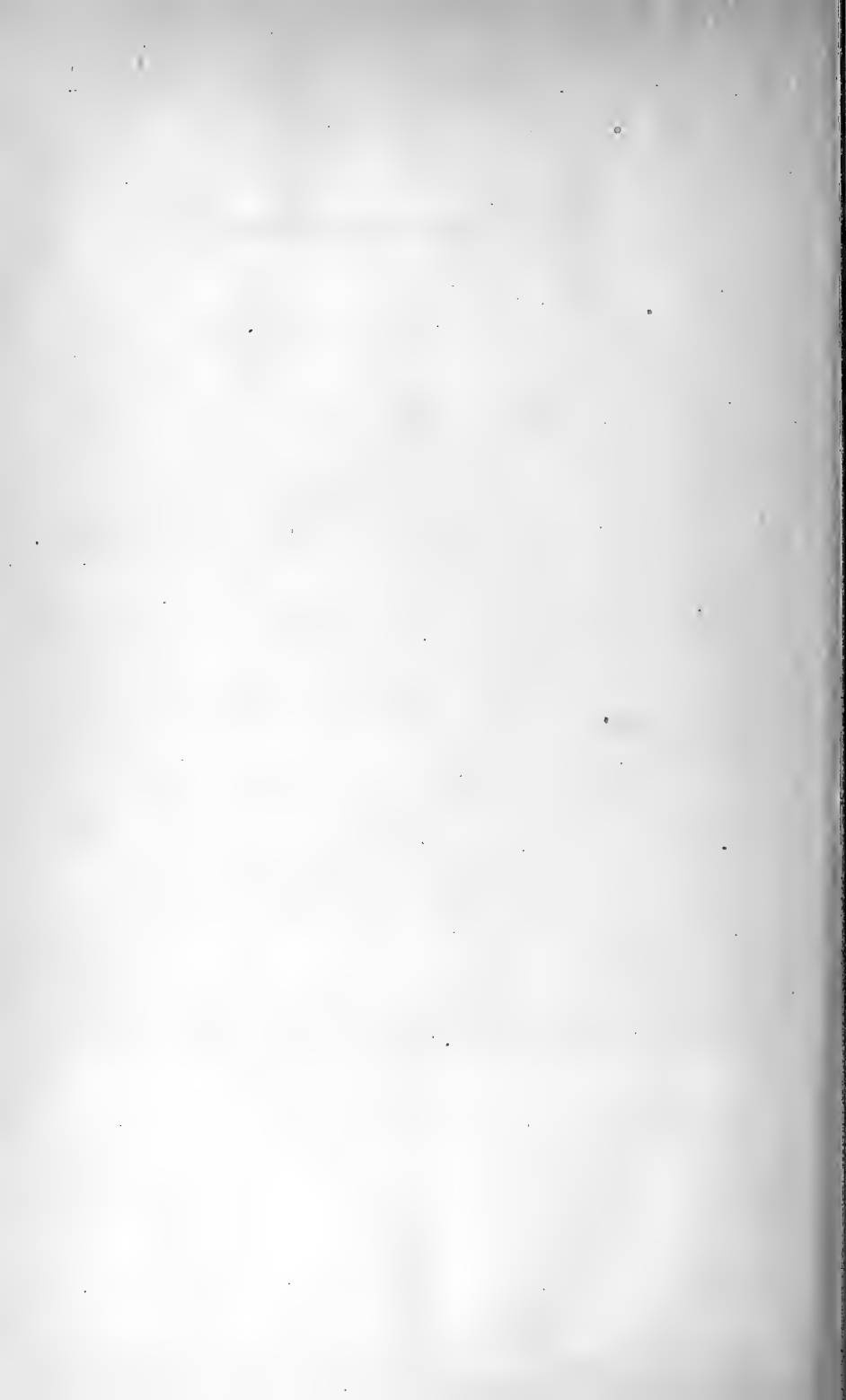
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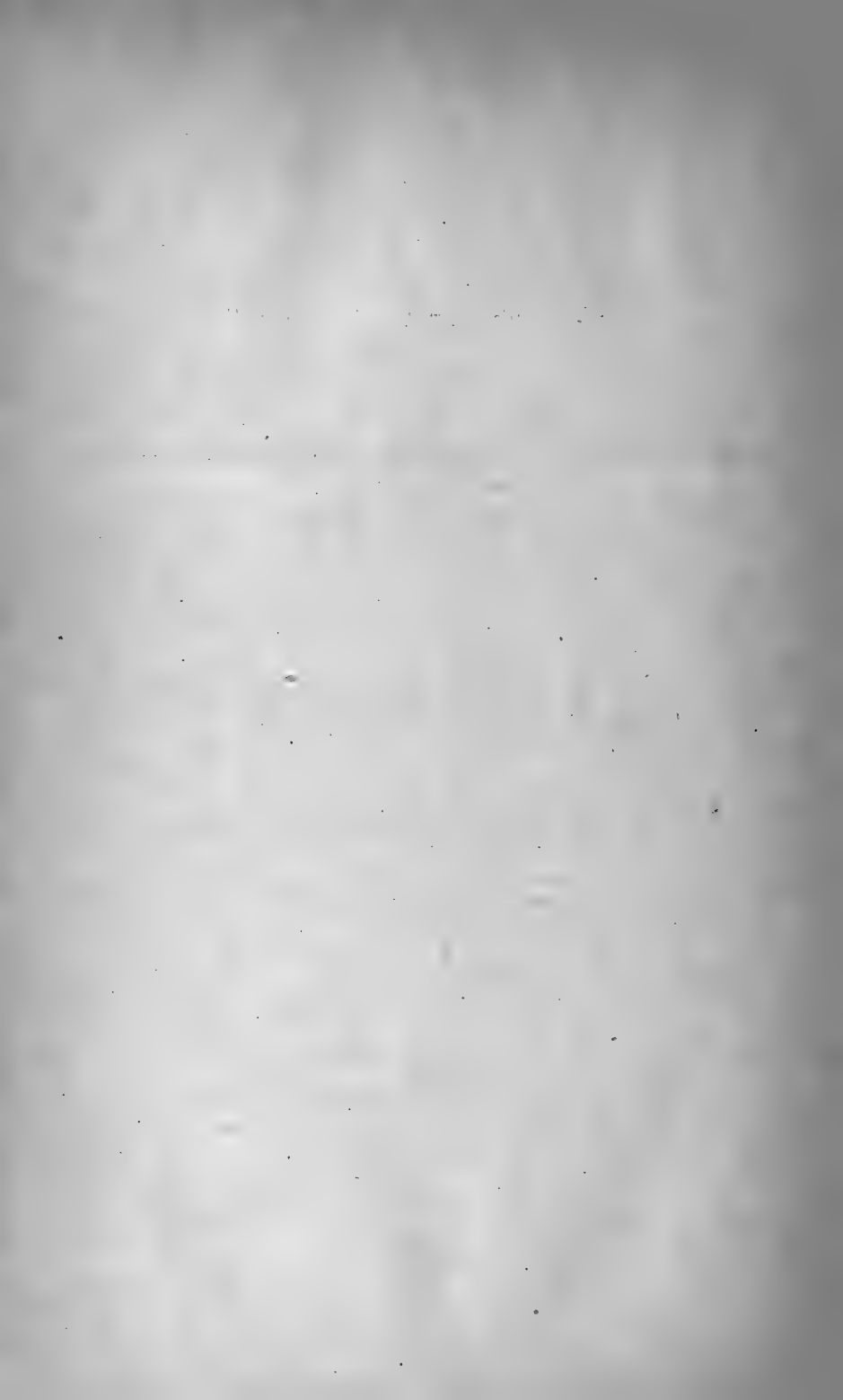
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ERRATA IN FIFTH REPORT.

- Page 148, line 4, for zanthomelæna read xanthomelæna.
Page 170, line 7, for Dallas read (Dallas).
Page 174, line 17, transfer first comma from after chærocampa to before.
Page 213, line 3, for Boisdaval read Boisduval.
Page 219, line 19, for ac ss read across.
Page 224, line 3 from bottom, and p. 225, line 12, for Boder read Bodee.
Page 224, line 9 from bottom, for L. A. Howard read L. O. Howard.
Page 231, *dele* first and third paragraphs, relating to tobacco feeding.
Page 257, line 15, for Guer read Guér.
Page 268, line 14, for subjec read subject.
Page 282, line 1, for *Trypetidiæ* read *Trypetidæ*.
Page 283, line 22, for Thirth read Thirty.
Page 283, line 3 from bottom, in foot-note, for more read less.
Page 295, line 17, for Raf. read (Raf.).
Page 313, bottom line, for he read the.
Page 330, line 24, for Prionatus read Prionotus.
Page 331, line 20, col. 1, transfer 321 to line 21.
Page 332, line 12 from bottom, for 179 read 177.
Page 335, read *Julus cæruleocinctus*, 307, 326.
Page 338, line 21, for Ormerod read Ormerod.
Page 343, line 16, for 323 read 324.

NOTE.—This leaf may be transferred to the Fifth Report by those who have received copies thereof not containing the above table—nearly 600 copies having been distributed without it.



REPORT
OF THE
STATE GEOLOGIST,
FOR THE YEAR 1889.



R E P O R T.

ALBANY, December, 1889.

To the Honorable the Regents of the State of New York:

GENTLEMEN.—The duties of the State Geologist for the past year have been almost entirely with the collection and preparation of material for Volume VIII of the Palæontology of the State. In the report of the State Geologist for 1888, which has been printed during the past month, I have given a short statement of the character and contents of Volume VII of the Palæontology which was published last year. I have also there given some account of what has been done in the collections and preparations made for the publication of Volume VIII, which I need not repeat in this place. In that report I have communicated a list of the genera of Palæozoic Brachiopoda arranged under the several families, for the purpose of showing the scope of the work. A list of the microscopic and other preparations for illustrating the structure of these fossils. The plates indicated as in progress in the last report have been completed, and others are already prepared for the lithographer.

There are 300 pages of manuscript ready for the printer and the printing commenced, about fifty pages being already in type. A large part of the manuscript is descriptive of the *Inarticulate Brachiopoda*, and for the illustration of the genera under this order thirteen plates will be required. Of this number eight plates have already been lithographed, and drawings for the remaining five plates are prepared for or already in the hands of the lithographer.

In order to give a better conception of the character and extent of the inarticulate division of the Brachiopoda, I append a list of the genera which have been recognized and described by different authors under the several families. The greater number of the genera here recorded have been illustrated either upon the first thirteen plates or in the text of the volume.

Order Inarticulata.

FAMILY LINGULIDÆ.

Genus.

- | | |
|------------------------------|------------------------------|
| 1. Lingula, Bruguière, 1792. | 5. Lingulella, Salter, 1866. |
| 2. Dignomia, Hall, 1871. | 6. Barroisella, gen. nov. |
| 3. Glossina, Phillips, 1848. | 7. Lingulops, Hall, 1871. |
| 4. Lingulepis, Hall, 1863. | 8. Lingulasma, Ulrich, 1889. |

OBOLIDÆ.

- | | |
|--------------------------------|---------------------------------|
| 9. Obolus, Eichwald, 1829. | 17. Aulonotreta, Kutorga, 1848. |
| 10. Obolella, Billings, 1861. | 18. Acritis, Volborth, 1869. |
| 11. Dicellomus, Hall, 1871. | 19. Elkania, Ford, 1886. |
| 12. Leptobolus, Hall, 1872. | 20. Spodylobolus, McCoy, 1852. |
| 13. Schmidtia, Volborth, 1869. | 21. Paterula, Bañrande, 1879. |
| 14. Neobolus, Waagen, 1885. | 22. Schizobolus, Ulrich, 1886. |
| 15. Mickwitzia, Schmidt, 1888. | 23. Discinolepis, Waagen, 1885. |
| 16. Monobolina, Salter, 1865. | |

SIPHONOTRETIDÆ.

- | | |
|------------------------------------|-------------------------------------|
| 24. [?] Kutorgina, Billings, 1861. | 32. Discinopsis, gen. nov. Matthew. |
| 25. Schizopholis, Waagen, 1883. | 33. Mesotreta, Kutorga, 1848. |
| 26. Volborthia, Möller, 1874. | 34. Siphonotreta, Verneuil, 1845. |
| 27. Iphidea, Billings, 1874. | 35. Schizambon, Walcott, 1884. |
| 29. Aerotreta, Kutorga, 1848. | 36. Keyserlingia, Pander, 1861. |
| 30. Acrothele, Linnarsson, 1876. | 37. Helmersenia, Pander, 1861. |
| 31. Linnarssonina, Walcott, 1885. | |

DISCINIDÆ.

- | | |
|------------------------------------|----------------------------------|
| 38. (?) Discinisca, Dall, 1871. | 43. Røemerella, gen. nov. |
| 39. Orbiculoidea, D'Orbigny, 1847. | 44. Trematis, Sharpe, 1847. |
| 40. Schizotreta, Kutorga, 1848. | 45. Orbicella, D'Orbigny, 1847. |
| 41. Lindstromella, gen. nov. | 46. Schizocrania, Hall and Whit- |
| 42. Ehlertella, gen. nov. | field, 1875. |

TRIMERELLIDÆ.

- | | |
|----------------------------------|---------------------------------|
| 47. Trimerella, Billings, 1862. | 51. Conradia, Hall (MS.), 1871. |
| 48. Monomerella, Billings, 1871. | 52. Gotlandia, Dall, 1870. |
| 49. Rhinobolus, Hall, 1871. | 53. Obolellina, Billings, 1871. |
| 50. Dinobolus, Hall, 1871. | 54. Lakhmina, Ozhbest. |

CRANIADÆ.

- | | |
|----------------------------------|-----------------------------------|
| 55. Crania, Retzius, 1781. | 61. Palæocrania (Eichwald), Quen- |
| 56. Orbicula, Cuvier, 1798. | stedt, 1871. |
| 57. Criopus, Gray, 1821. | 62. Choniopora, Schaueroth, 1854. |
| 58. Craniella, Ehlert., 1888. | 63. Craniops, Hall, 1859. |
| 59. Cardinocrania, Waagen, 1885. | 64. Pholidops, Hall, 1860. |
| 60. Pseudocrania, McCoy, 1851. | |

Following the inarticulate Brachiopoda in the arrangement adopted, we have already four plates lithographed in the family Orthidæ, and of the Strophomenida and Productidæ there are thirteen plates all of which were done previous to resuming work on the volume in 1888.

Our collections in the families STROPHOMENIDÆ, PRODUCTIDÆ and PORAMBONITIDÆ are still very deficient and it will be necessary to farther collections in the group of STREPTORHYNCHUS and PRODUCTUS especially of those from the Carboniferous formations.

The family SPIRIFERIDÆ, as at present recognized, embraces the following genera :

Spirifera, Sowerby, 1815.	Mimulus, Barrande, 1879.
Trigonotreta, Konig, 1825.	Crytia, Dalman, 1828.
Brachythyris, McCoy, 1844.	Ambocœlia, Hall, 1860.
Choristites, Fischer, 1825.	Mentzelea, Quenstedt, 1871.
Martinia, McCoy, 1844.	Spiriferina, D'Orbigny, 1847.
Reticularia, McCoy, 1844.	Cyrtina, Davidson, 1858.
Martiniopsis, Waagen, 1883.	Syringothyris, Winchell, 1863.

In this family we have a very good collection of material available for our use. This collection contains representations of about half the known American species recorded under the genus SPIRIFERA. Under this family including the genus SPIRIFERA proper, SYRINGOTHYRIS, CYRTIA, SPIRIFERINA and some other subordinate genera we have already sixteen plates lithographed, including four plates which were done during the past year.

I have proposed a grouping of the Spirifera according to the following arrangement :

PROPOSED SUBDIVISIONS OF THE GENUS SPIRIFERA.

Number of species classified in the following list:

- 5 Radiata. Clinton — Lower Helderberg and Carboniferous — Chemung.
- 10 Fimbriata (plicate). Niagara — Corniferous.
- 7 Fimbriata (nonplicate). Niagara — Upper Coal Measures.
- 11 Lamellosa (ventral valve septate). Niagara — Upper Coal Measures.
- 9 Lamellosa (ventral valve nonseptate). Lower Helderberg — Hamilton.
- 34 Mesio-plicata. Oriskany — Upper Coal Measures.

- 3 *Martinia* (Læves). Corniferous — Coal Measures.
 4 *Ambocoëlia*. Hamilton — Upper Coal Measures.
 21 *Syringothyris*. Onondaga — Warsaw.

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Species studied and placed under their appropriate divisions....	104
Species remaining to be studied.....	117

Species classified and arranged under the following heads:

RADIATA.

- S. radiata*, Hall. Clinton and Niagara groups.
S. Eudora, Hall. Niagara.
S. Niagarensis, Conrad. Niagara.
S. Macroleura, Conrad. Lower Helderberg.
 ? *S. mesastrialis*, Hall. Chemung.
S. ————— n. sp. Lower carboniferous limestone.

FIMBRIATA (plicate).

- S. crispa*, Hisinger. Niagara.
S. crispa, var. *simplex*, Hall. Niagara.
S. Saffordi, Hall. Lower Helderberg.
S. concinna, Hall. Lower Helderberg.
S. Vanuxemi, Hall. Lower Helderberg.
S. cycloptera, Hall. Lower Helderberg.
S. octocosta, Hall. Lower Helderberg.
S. tribulis, Hall. Oriskany sandstone.
S. arrecta, Hall. Oriskany.
S. duodenaria, Hall. Corniferous limestone.

FIMBRIATA (nonplicate).

- S. bicostata*, Hall. Niagara.
S. modesta, Hall. Lower Helderberg.
S. lævis, Hall. Portage.
S. pretinatura. Chemung.
S. hirta, White & Whitfield. Choteau.
S. pseudolineata, Hall. Kinderhook—Keokuk.
S. setigera, Hall. St. Louis—Chester.
S. clara, Swallow. Chester group.
S. lineata, Martin. Coal Measures—Upper Coal Measures.

LAMELLOSA (a septum in ventral valve).*

- S. sulcata*, Hisinger. Niagara.
- S. perlamellosa*, Hall. Lower Held.
- S. raricosta*, Conrad. Corniferous.
- S. sculptilis*, Hall. Hamilton.
- S. ziczac*, Hall. Hamilton = (*S. consobrina*, D'Orb.)
- S. mesacostalis*, Hall. Chemung.
- S. solidirostris*, White. Kinderhook.

SHELL PUNCTATE.

- A species undetermined from the Up. Waverly and Keokuk.
- S. transversa*, McChesney. Chester.
- S. spinosa*, Nor. & Prat. Chester.
- S. Kentuckensis*, Shumard. Up. Coal Measures.

LAMELLOSA (no septum in ventral valve).

- ? *S. Engelmanni*, Meek & Worthen. Lower Helderberg.
- S. Cumberlandia*, Hall. Oriskany.
- S. submucronata*, Hall. Oriskany.
- S. mucronata*, Conrad. Hamilton.
- S. macra*, Hall. Corniferous.
- S. bimesialis*, Hall. Hamilton.
- S. subattenuata*, Hall. Hamilton.
- S. varicosa*, Conrad. Hamilton.
- S. segmenta*, Hall. Hamilton.

MESIO-PLICATA (non-punctate).

- S. arenosa*, Conrad. Oriskany.
- S. divaricata*, Hall. Corniferous and Hamilton.
- S. Grieri*, Hall. Corniferous.
- S. Orestes*, Hall. Upper Devonian.
- S. Whitneyi*, Hall. Upper Devonian.
- S. Hungerfordi*, Hall. Upper Devonian.
- S. disjuncta*, Sowerby. Chemung.
- S. Marionensis*, Shumard. Choteau.
- S. Missouriensis*, Swallow. Choteau.
- S. Vernonensis*, Swallow. Kinderhook.
- S. biplicata*, Hall. Kinderhook.

* The presence of a septum in the ventral valve has been regarded as evidence of the relationship of these forms to SPIRIFERINA, and some of the species have been cited under that genus. The author, long ago, recognized this feature as allying these lamellose forms with the genus *Spiriferina*, but thus far we have failed to find the punctate shell structure characteristic of that genus.

- S. suborbicularis*, Hall. Kinderhook to Keokuk.
S. Newberryi, Hall. Upper Waverly.
S. striatiformis, Meek. Upper Waverly.
S. Grimesi, Hall. Burlington.
S. Forbesi, Hall. Burlington.
S. imbrex, Hall. Burlington.
S. incerta, Hall. Burlington.
S. Keokuk, Hall. Keokuk.
S. neglecta, Hall. Keokuk.
S. fastigata, Meek & Worthen. Keokuk. (= *S. Mortonana*, Miller.)
S. Logani, Hall. Keokuk.
S. rostellata, Hall. Keokuk.
S. tenuimarginata, Hall. Keokuk.
S. tenuicostata, Hall. Keokuk.
S. lateralis, Hall. Keokuk and St. Louis.
S. subæqualis, Hall. Keokuk and St. Louis.
S. Keokuk var., Hall. S. Littoni, Swallow. St. Louis.
S. Leidyi, Norwood and Pratten. St. Louis and Chester.
S. bifurcata, Hall. St. Louis.
S. subcardiformis, Hall. St. Louis.
S. increbescens, Hall. Chester.
S. opima, Hall, Rockymontana, Macon. Coal Measures.
S. camerata, Morton. Upper Coal Measures.
S. Texana, Meek, multigranosa, Worthen. Upper Coal Measures.

MARTINIA.

- S. maia*, Billings. Corniferous.
S. subumbonata, Hall. Hamilton.
S. glaber var. *contracta*, Meek & Worthen. Coal Measures.

AMBOCELIA.

- A. umbonata*, Conrad. Hamilton.
A. præumbona, Hall. Hamilton.
A. gregaria, Hall. Chemung.
S. planoconvexa, Shumard. Upper Coal Measures.

SYRINGOTHYROID FORMS.

In this group are included certain forms of *Spirifera* with simple low plications granulose or papillose surface makings, and showing a tendency to develop a callosity, mode or process within, and in advance of, the apex of the foramen; which in its fuller development becomes an extended process or slate and is finally incurved and enrolled forming the characteristic tubular sheath of *Syringothyris*.

1. *S. perextensa*, Meek and Worthen. Onondaga limestone.
2. *S. macrothyris*, Hall. Corniferous limestone.
3. *S. angusta*, Hall. Corniferous.
4. *S. granulifera*, Hall. Hamilton group.
5. *S. plena*, Hall. Burlington group.
6. *S. Marcyi*, Hall. Corniferous and Hamilton.
7. *S. Wortheni*, Hall. Hamilton.
8. *S. pennata*, Owen. (= *S. Atwaterana* Miller.) Hamilton.
9. *S. Parryana*, Hall. Hamilton.
10. *S. eurutines*, Owen. Hamilton.
11. *S. Manni*, Hall. Corniferous.
12. *S. audacula*, Conrad.= ? *S. Medialis* Hall. Hamilton.
13. *S. macronota*, Hall. Hamilton.
14. *S. fornax*, Hall. Hamilton.
15. *S. aspera*, Hall. Hamilton.
16. *S. MacBridie*, Calvin. Hamilton.
17. *S. alta*, Hall. Chemung.
18. *S. extenuata*. Kinderhook.
19. *S. Carteri*, Hall. Waverly.
20. *S. texta*, Hall. Knobs.
21. *S. subcuspidata*, Hall. Keokuk.
22. *S. propinqua*, Hall. Warsaw.
23. *S. Hannibalensis*, Swallow.= ? *S. typa*, Winchell. Kinderhook.

Under the families *ATHYRIDÆ*, *NUCLEOSPERIDÆ*, *ATRYPIDÆ*, *ZYGOSPIRIDÆ* and *RHYNCHONELLIDÆ* we have need of much material beyond that already possessed. In the family of *PENTAMERIDÆ* we have a pretty good collection for our purpose, though it is far from complete and will need considerable additions before completing the volume.

Of the important family *TEREBRATULIDÆ* we have only very meagre collections and in order to give a respectable representation of most of the genera it will be absolutely necessary to make farther collections in the field or to borrow from collections, as already made by individuals or institutions. The latter method is the only feasible one when we consider the short time in which the volume is to be completed.

Both the *PRODUCTIDÆ* and *TEREBRATULIDÆ* are more largely represented in the Carboniferous rocks of the west and to these we must resort for our means of illustrating these families. The Carboniferous forms of *Streptorhynchus* are also those most essential for our use in the preparation of this volume.

The families coming after the Spiriferidæ, and which are to be treated of in this volume are the following :

ATHYRIDÆ.

- | | |
|----------------------------------|-----------------------------------|
| 129. Athyris, McCoy, 1844. | 138. Camarium, Hall, 1859. |
| 130. Spirigera, D'Orbigny, 1847. | 139. Meristella, Hall, 1859. |
| 131. Euthyris, Quenstedt, 1871. | 140. Meristina, Hall, 1867. |
| 132. Actinoconchus, McCoy, 1844. | 141. Charionella, Billings, 1861. |
| 133. Seminula, McCoy, 1844. | 142. Whitfieldia, Davidson, 1882. |
| 134. Cleiothyris, King, 1850. | 143. Pentagonia, Cozzens, 1846. |
| 135. Spirigerella, Waagen, 1883. | 144. Goniocœlia, Hall, 1861. |
| 136. Kayseria, Davidson, 1882. | 145. Bifida, Davidson, 1882. |
| 137. Merista, Suess, 1851. | |

NUCLEOSPIRIDÆ.

- | | |
|--------------------------------|--------------------------------|
| 146. Nucleospira, Hall, 1858. | 152. Eumetria, Hall, 1864. |
| 147. Schnuri, gen. nov. | 153. Uncites, De France, 1825. |
| 148. Retzia, King, 1850. | 154. Uncinella, Waagen, 1883. |
| 149. Rhynchospira, Hall, 1859. | 155. Dayia, Davidson, 1882. |
| 150. Trematospira, Hall, 1857. | 156. Hindella, Davidson, 1882. |
| 151. Acambona, White, 1862. | |

ATRYPIDÆ = ZYGOSPIRIDÆ.

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|------------------------------------|-----------------------------------|
| 157. Atrypa, Dalman, 1828. | 161. Glassia, Davidson, 1882. |
| 158. Spirigerina, D'Orbigny, 1847. | 162. Anazyga, Davidson, 1882. |
| 159. Zygospira, Hall, 1862. | 163. Grünewaldtia, Tschernyschew, |
| 160. Cœlospira, Hall, 1863. | 1885. |

KONINCKINIDÆ.

164. Anoplothea, Sandberger, 1857.

RHYNCHONELLIDÆ.

- | | |
|-------------------------------------|---------------------------------|
| 165. Rhynchonella, Fischer, 1809. | 172. Rhynchopora, King, 1856. |
| 166. Cyclothyris, McCoy, 1884. | 173. Eatonia, Hall, 1857. |
| 167. Hypothyris, Phillips, 1841. | 174. Stenocisma, Conrad, 1839. |
| 168. Wilsonia, Quenstedt, 1871. | 175. Leiorhynchus, Hall, 1860. |
| 169. Uncinulus, Bayle. | 176. Karpinskia, Tschernyschew, |
| 170. Terebratuloides, Waagen, 1883. | 1885. |
| 171. Rhynchotrema, Hall, 1860. | |

PENTAMERIDÆ.

- | | |
|---------------------------------|--------------------------------------|
| 177. Pentamerus, Sowerby, 1813. | 184. Anastrophia, Hall, 1867. |
| 178. Zdimir, Barrande, 1881. | 185. Brachymerus, Shaler, 1865. |
| 179. Sieberella. | 186. Camarella, Billings, 1859. |
| 180. Gypidia, Dalman, 1828. | 187. Stricklandinia, Billings, 1863. |
| 181. Gypidula, Hall, 1857. | 188. Amphigenia, Hall, 1867. |
| 182. Pentamerella, Hall, 1867. | 189. Clorinda, Barrande, 1879. |
| 183. Camarophoria, King, 1846. | |

SUMMARY OF THE CONDITION OF THE VOLUME AT THE END OF
NOVEMBER, 1889.

Pages of manuscript prepared	300
Pages in type	50
Plates of drawings prepared	14
Of these are lithographed and printed	6
Others in the lithographer's hands	4
Others ready for the lithographer	2

In order to give a more tangible evidence of the condition of the work, I have placed upon the secretary's table a bound copy of all the plates lithographed and printed for the volume, and also a number of plates of drawings arranged for the lithographer. Besides these drawings there is a large number of drawings available for the lithographer.*

Requirements for the Completion of the Volume.

Collections of ORTHIS STREPTORHYNCHUS and PRODUCTUS from the Carboniferous, PORAMBONITES, ATHYROIDS, showing interior, MERISTOIDS especially *Meristella naviformis* and of *Atrypa conjesta* of the Clinton group. The genera *Retzia*, *Eumetria*, *Acambona* and *Terebratuloids* from all the Palæozoic formations.

In order to accomplish this work it will be necessary to visit all the public and private collections within our reach, and to make field collections where practicable. There are numerous types of species in the collections of the Canadian Geological Survey which must be examined before the volume can be made complete.

The numerous species described in connection with the Geological Survey of Missouri, and which are now in the collections of the University of Missouri, require to be studied before we can make our work complete.

During the past year we have added to our material for study and illustration a collection of *Lingula* and *Discina*, from the Clinton and Niagara groups of Hamilton, Ontario. Through the favor of Mr. B. E. Walker, of Toronto, we have the loan of some good specimens of the typical species of *Stricklandinia*, and other forms from the Clinton and Niagara groups.

* Since the communication of this Report that portion of the volume relating to the inarticulate Brachiopoda has been printed, making 182 pages, with 14 plates illustrating genera. This part of the work was completed in April, 1890, and as this document is passing through the press, the manuscript for the following portions of the volume is being put into the hands of the printer:

Through the kindness of Prof. Hyatt, of Cambridge, we have been favored with the loan of his collection of Brachiopoda from the Island of Anticosti. The peculiar forms known only at that place, and from strata ranging from Lower Silurian to the Niagara horizons, make the collection a peculiarly interesting one.

GEOLOGICAL MAP OF THE STATE OF NEW YORK.

HISTORICAL.

The geological map of the State published in 1842 as the combined work of the four State Geologists, was upon too small a scale to properly represent the extent and limits of the geological formations. Moreover, there were at that period no good geographical or topographical maps of the State, and the results of field work could only be laid down on such as the first edition of Burr's atlas, and other maps mainly compiled therefrom. It was only at a considerably later period that better maps of the counties, and finally of the State, were compiled; the best one yet produced, so far as known to the writer, being that by Prof. J. H. French, C. E., of Syracuse, and published by H. H. Lloyd & Co., in New York, in 1865. The want of a better geological map of the State had been felt among professors and teachers, and among all intelligent people, and the subject had on several occasions been brought before the Legislature, but without any definite action, till in 1881, when the sum of \$1,000 was appropriated for the purposes of field explorations for a review and revision of the limits of the geological formations within certain areas in the southern counties of the State, and of determining the relations of the New York rocks to those of Pennsylvania. The item of appropriation in the supply bill was vetoed by the Governor in June, 1880, but as the field-work had already been commenced immediately after the passage of the bill by the Legislature, and it was impossible to suspend the work without wrong to the parties then in the field, who had commenced the work in good faith, it became necessary, therefore, for the State Geologist to assume the responsibility of paying for this work from his personal means. The expenses thus incurred amounted to somewhat over \$1,200, for which no reimbursement has been made.

The result of this work was laid down upon a Post-route map of the State of New York, and it has served as a guide in our later map coloring.

About this time I was also able to secure some information regarding the limits of certain formations in Otsego, Chenango and Cortland counties through the agency of the young men collecting fossils for the Palæontology of New York. The information obtained from these different sources has since been incorporated with other knowledge and combined in a single map.

In preparing my report at the close of 1882 the Secretary of the Board of Regents suggested that I prepare and communicate with my Annual Report a geological map of the State as the most satisfactory contribution which I could make. An outline map of the State of New York was then prepared and colored to represent the geology of the State. The report being ordered printed, the State Printer made arrangements with Messrs. Bien & Co. to furnish a proper base map in two large sheets for laying down the geological coloring. When the first sheet of the map was received it was found that the representation of the water-courses was so imperfect and incomplete and the localities of towns and villages so few that it would be impossible to represent the geological outcrops upon such a map with any degree of accuracy. This sheet was returned with corrections marked and directions to have the drainage more accurately and completely represented, and the names of towns or villages inserted in their proper places. The corrected sheet was not returned, and the second sheet was only sent to Albany in the autumn of 1884. In the meantime the Report had been printed without the map; the regulations governing the contract with the State Printer requiring the documents to be delivered at the office of the Secretary of State within a specified limit of time. These facts were communicated in my Report of 1884, and are here transcribed to show the conditions then existing.

Early in the spring of 1884 I began negotiations with Major J. W. Powell, Director of the U. S. Geological Survey, with a view to obtaining assistance in collecting and combining the information we possessed regarding the geology of New York, and of representing the same upon a proper map by the usual method of colors. By direction of Major Powell, Mr. W. J. McGee, the

Geological cartographer of the U. S. Survey came to Albany in September, prepared to execute the work.

I brought together all the maps and parts of maps which had been used in my own field-work or that of my assistants. The two sheets of the map executed by Messrs. Bien & Co. were obtained from them with a view to their use in the completion of this work. These sheets were found to present the deficiencies and inaccuracies before noted to such a degree that we could make no use of the map for this purpose. Mr. McGee visited New York and the lithographic establishment of Messrs. Bien & Co., with a view of having the proper corrections made, and the map, thus corrected, used for our purpose. For reasons unknown to the writer, after discussing the matter on several occasions with the Secretary of the Regents, it was decided to recommend the preparation of a new base map, which was undertaken by the United States Geological Survey.

This new map, on a somewhat larger scale than the one before ordered, was completed and the coloring laid down in time to be presented with the report of the State Geologist, in February, 1885.

At a meeting of the Board of Regents on the 7th of January, 1885, the following resolution was adopted :

"Resolved, That the Director of the Museum be authorized to arranged with the Director of the United States Geological Survey to coöperate with him in the work of perfecting a geological map of the State of New York, and that in the meantime the Director be authorized to transmit a copy of the map in its present state to the Legislature for publication as a preliminary geological map."

This resolution was the result of previous conferences between Mr. McGee, representing the Director of the United States Geological Survey, myself and the Secretary of the Board of Regents, and also with the Chancellor of the Board.

The preliminary map referred to in this resolution was presented to the Legislature with the Annual Report of the State Geologist and ordered published, but such work not being contemplated in the contract of the State Printer, it required a special appropriation, which was made in the supply bill for that year. This appropriation was vetoed by the Governor; and a similar appropriation made in the following year was likewise vetoed and the map still remains unpublished.

All applications for the means of carrying out these plans of coöperation have been refused me. In 1887 a bill passed the Assembly giving \$1,300 for this purpose; but the measure was defeated in the Senate Finance Committee by hostile influences. Subsequently a resolution passed the Assembly authorizing the State Geologist to assume the ownership of the map and thus secure its publication in any manner he should see fit to adopt. This measure was defeated in the Senate Committee. The map still remains unpublished, and all means of coöperating with the Director of the United States Geological Survey have been refused, and no progress toward "perfecting a geological map" has been made on the part of the State of New York. In the meantime, however, private enterprise has done something. Mr. Dana has continued his work in the eastern counties of the State, and Professor Dwight of Vassar College, has continued his work in Dutchess county. The officers of the United States Geological Survey have contributed largely toward its present degree of completeness.

In the meantime the Director of the United States Geological Survey has prepared a base map on a considerably larger scale than the former one, and embracing parts of New Jersey and Pennsylvania with the purpose of showing the relations of the New York geology to the Coal Measures of the latter State.

In the preparation of this map and the expense of collecting and collating information, Major Powell has expended "not less than *four thousand dollars*," and the map has remained unutilized for nearly four years for the want of some action or coöperation on the part of the State of New York.

I have copied from the report of the State Geologist for 1884 the following statement:

GEOLOGICAL MAP OF THE STATE.

[From the Report of State Geologist for 1884, pp. 4-8, 1885.]

With the report of 1883 (published 1884), I communicated an outline or skeleton map as a basis for a geological map, together with colored maps of some portions of the country which had been more critically studied, for incorporation into the general map.

A contract was made by the State Printer with Messrs. Julius Bien & Co. for a complete map of the State to serve as the base for laying down the geological work. This map was not completed in time for the publication of the report, and no finished copy was furnished til

the spring of 1884. A critical examination of the proof-sheet then showed such deficiencies in the representation of drainage and other important features, that it was impossible to lay down with accuracy the limits of the geological formations. This condition of the map was reported to Messrs. Bien & Co.

In the meantime Major J. W. Powell, Director of the United States Geological Survey, had begun the preparation of a geological map to embrace the States of New York, New Jersey and Pennsylvania. To aid this object, a copy of the uncompleted base made by Bien & Co., together with manuscript and colored maps, and all information possessed by myself, was freely furnished to the Director of the United States Geological Survey. This map of the three States, embodying all available, reliable information, has already been completed. In November last Major Powell placed at my disposal the services of a very competent geological cartographer, Mr. W. G. McGee, furnishing at the same time a base map from the United States Survey Office, and he has carefully laid down on this map the geological formations of New York so far as their limits and extent are actually known and determined. A copy of this map will be communicated with the present report, and its publication will remain subject to the order of the Legislature.

In the present connection I should not omit to refer to the geological map of the State, published in 1843, at the close of the geological survey. This map is published as the result of a survey which had been continued for four years, a work beginning without any reliable knowledge of the succession or geographical extent and distribution of the geological formations embraced within the limits of the State. The time allowed had been insufficient for a thorough investigation of the geology, and there were no maps available for laying down the field work with the care and accuracy requisite. The map was the product of four independent workers in the field, and in order to harmonize the results of observation it became necessary to make concessions and to accept modifications, both in nomenclature and in geographic limitations, in order to compile an acceptable geological map of the State. Rock strata of similar character and in near relation, were considered of the same age, though since that time distinctions have been clearly shown. We had then no palæontological guide, or but a very imperfect one, and this want was not fully apprehended or appreciated. The map should properly have been entitled, *a preliminary geological map of the State*.

That map, now more than forty years old, has served its purpose, as all preliminary maps do, by giving an expression to the great

geological features of the State, and in the main to their true order of succession. But an intelligent community can not now rest satisfied with so imperfect and incomplete a work as the map published in 1843. Since that time great progress has been made in geological investigation; many points which were then obscure and unsettled have been cleared up. The basis and nomenclature given in our old map have been a foundation for better results. The work of our neighbors in New Jersey, Pennsylvania, Vermont and Canada has shown us the necessity of a revision. Each one of these States, though having published a geological map about the same period, or later, than our own, has, nevertheless, organized a second geological survey, and has published, or is publishing, a revised geological map of its territory. The same condition is true of every country where geological investigations were made and maps published so long ago as our own. The same condition is equally true with regard to all geographical as well as geological maps.

In our own case, the State Geologist has been for a long time collecting information for the correction of the geological map. This work has been done almost wholly at his own personal expense. His own work, combined with that which he has been able to obtain from all other sources, is represented on the map accompanying this report, which is presented for publication. In the explanation of the map, due credit has been given to every person contributing information.

The deficiencies shown in the geological map of New York demand further exploration and investigation; and no time should be lost in providing the means for completing the map in a creditable manner.

A good geological map of the State is of incalculable value in every respect. Its scientific accuracy is an important consideration; for we have proposed a geological nomenclature which it is incumbent on us to sustain by continued investigation and publication until every point of doubt and difficulty shall have been settled, and that we may be able to show the exact areas and order of succession of all the formations in every part of the State. I conceive that this is due from the State to the entire community, not only of this State, and the United States, but of the whole scientific world. I believe that at this moment the State could offer no more acceptable publication to the scientific, the educational, and the economic interests of the people than a completed geological map.

Its economic value would lie in the fact that the limits of all the geological formations being known, the areas of those furnishing materials of value, and the kind of each, could be designated; as, for example, all granites, limestones, sandstones, and other materials for

building or ornamental use; the position and extent of the hydraulic limestones; the gypsum and salt beds; the extent and geological relations of the various iron ores; and of all other materials entering into daily use in civilized life.

To the schools and colleges of the State, such a map would be of inestimable value. A copy of the map should be placed in every school-room, in order to familiarize the pupils with the nature and geographical distribution of the rocks and the economic products of each. This would give more rational knowledge regarding the State and its resources, than could be derived from any other method of teaching whatever.

At the present time, a finished geological map is impossible, because of the deficiencies in our knowledge. A few examples may be given in illustration. We know that the Adirondack region is occupied, to a very great extent, by what is known as the Laurentian system of rocks, which consist of gneiss and granite, which in their lower divisions, carry extensive beds of magnetic iron ore; while the upper portions, consisting of granitic rocks of a different character, known as Labradorite, carry beds of titaniferous magnetite. No one has yet shown the limits of the area occupied by each of these divisions, or their true relations to each other; and yet this knowledge is of the highest importance in regard to the future product of the valuable ores of this part of the country. The magnetic ores of the lower portion of the system are extremely important, and give an immense revenue to the owners of the mines, while those of the upper portion have not hitherto been wrought to advantage.

When we come to the boundaries of this great Laurentian area, we can not speak with certainty of its limitations, especially upon the northwest and west. There the rocks of this age are succeeded by another set of crystalline rocks, consisting of granitic masses, with crystalline limestone, with breccia or conglomerate, and carrying extensive beds of red hematite ore. This is largely consumed in the iron furnaces, in connection with the magnetic ores. But although of such immense importance, and so positively distinct in lithological aspect and economic products, the limits of the two formations have never been indicated with any degree of exactness.

On the southern and southeastern slope of the Adirondack region, the country is greatly disturbed by a succession of faults, which render geological work slow of accomplishment, and the difficulties of indicating the limits of the succeeding formations are great.

On the east side of the Hudson river, from Vermont to the Highlands, the relations of the several formations are in doubt, and very

conflicting views are still entertained regarding the stratigraphical relations of important formations. The difficulties in this region have arisen from two causes. We have a set of slates and argillaceous sandstones, known as the Hudson river group, occupying a portion of this area. In absolute juxtaposition with these are a series of much older slates and limestones, which have been brought up to their present position by deep-seated geological movements. The later erosion of the surface, with the covering of gravel, sand and clay, has obliterated, or concealed for the most part, the lines of junction, and the two series, so distinct in age, have been regarded as a single formation, and were thus colored on our first geological map.

Still further eastward are a series of crystalline schists and limestones, which are regarded as the metamorphic condition of the Trenton limestone and the shales of the Hudson river group. The true limits and extent of these several formations, on the east side of the Hudson river, have not yet been determined, and for the present the map must remain only partially colored over this part of the country.

In the region of the Catskill mountains, both on the southeast and northwest, there are portions of country where the absolute limits and order of succession among strata have not been fully settled; and further investigation is required. The smaller areas in the southwestern portion of the State may be completed with less labor, as we shall have the results of the county surveys in Pennsylvania to compare with our own work in this part of the State. Some contributions to the limits of certain formations in the southwestern part of the State have been made by Mr. C. E. Beecher, of the State Museum, as the results of his own observations and those of Mr. F. A. Randall, of Warren, Penn.

During the last year, 1884, some work was done in Otsego and Chenango counties, with a view to comparison and verification with the work done in that region between 1868 and 1871, by Dr. J. W. Hall and Mr. George B. Simpson.

In the autumn of last year, I employed Mr. C. E. Hall to make some investigations for rectifying the limits of the geological formations in Saratoga, Warren and Washington counties, which were known to be incomplete and erroneous in their representation on the map. This investigation was interrupted after a month of field-work, and the results, while contributing to our knowledge of the limits and extent of certain formations, showed more clearly the necessity of further examination before any reliable geological map of that part of the State can be completed.

To complete the entire work will require the coöperation of many workers, or the continued systematic work of one or more persons. The State Geologist and the Museum staff can not, with their present resources, supply all the deficiencies. Some of the problems are extremely intricate and perplexing, and must be studied in their various aspects by several persons; and the best expert knowledge is required for their final elucidation.

I would most earnestly recommend that the completion of this important field-work be undertaken during the coming season; and that the State Geologist be authorized to employ some competent person, under his immediate supervision, to carry on this work in a systematic manner to its completion.

The professors in colleges, the local geologists, the investigators in adjoining States, can all contribute much to complete our knowledge of the details, while the whole may be combined under a single direction.

In order to make such a coöperation possible and intelligent, it is necessary to show the present boundaries of our knowledge; and the regions in which farther exploration is necessary, and in which our future working is to be carried on.

Several eminent geologists have suggested the publication of a *Preliminary Geological Map* of the State, showing the limits of the formations so far as known, and indicating the regions as yet undetermined. This would serve to direct attention to the undetermined points and promote investigation. I am most emphatically in favor of this course; it seems to me the only proper one to be pursued under the circumstances; and I believe that the publication of such a map would almost certainly result in the preparation and publication of a complete geological map which to every interest of a State of 5,000,000 of people is so important. I believe the publication of the present map will do more to bring about the production of a perfected geological map than any arguments which may be made from any direction whatever; and that this is the only method by which the subject can be fully brought before the public.

In the present condition of our knowledge, I am quite unwilling to communicate to the Legislature a map fully colored to represent the distribution of our geological formations. Such a map would be misleading, and would greatly retard the progress and completion of a better map, and to color the map entirely at this time would only be a hindrance to real progress. I can not assume to know that which is yet undetermined from actual investigation, and I must admit that

we do not yet know the geology of the State of New York with that degree of certainty which will warrant the publication of a geological map covering the entire area of the State.

Respectfully submitted.

(Signed.) JAMES HALL,
State Geologist.

FOSSIL DICTYOSPONGIDÆ OF THE DEVONIAN AND CARBONIFEROUS FORMATIONS.

In 1882 the writer communicated to the American Association for the Advancement of Science, at its meeting in Montreal, some "Notes on the Family Dictyospongidæ," accompanied by lithographed plates from the Thirty-fifth Report on the State Museum of Natural History, illustrating the genera *CYATHOPHYCUS*, *DICTYOPHYTON*, *PHRAGMODICTYA*, *CLATHROSPONGIA*, *PHYSOSPONGIA*, and showing their relations to *UPHANTÆNIA*. The paper was not communicated for publication, but an abstract, together with the plates and explanations, "subject to revision," was placed in the hands of the secretary for preservation.

This preliminary notice had already been published in the Thirty-fifth Museum Report, and also issued as a separate pamphlet, accompanied by four double octavo plates, with explanations. In this notice thirty-seven species had been described under nine generic designations.

The question of the publication of this material as a separate paper or bulletin was brought before the committee on the State Museum on the 7th of January, 1885, and the following action was had thereon:

EXTRACT FROM MINUTES OF THE BOARD OF REGENTS OF MEETING HELD JANUARY 7, 1885.

"The committee on the State Museum recommended the adoption of the following resolution:

"WHEREAS, Director Hall has prepared an important monograph on the subject of Dictyospongidæ, which can not be included in the publication of the volumes of Palæontology provided for in chapter 355 of the Laws of 1883, and

"WHEREAS, It is important that this monograph be published at an early day; therefore,

"*Resolved*, That the monograph of Director Hall on Dictyospongiadæ be published by the museum as Bulletin No. 1.

"The resolution was accordingly adopted."

At the time the preceding resolution was passed the greater part of the drawings for the illustration of these fossils had been made, and the remainder were soon afterwards completed. These will require at least twenty-five quarto plates for their proper illustration. To lithograph these plates would occupy the entire time of our lithographer for one year, and now that he has other similar work upon his hands it will require two years to complete these plates:

I have several times applied to the chairman of the Committee on the State Museum for permission to place these plates in the hands of the lithographer, but such permission has not been granted, and at this time, after nearly five years have elapsed, the work remains in essentially the same condition as at that time, without any power or authority on my part to go forward.

In the meantime other explorers, stimulated by the preliminary publications in the New York State Museum Reports, have entered the field, and may soon have the means of anticipating our publication and reaping the credit which belongs to us by right of prior investigation and preliminary publication.

As in all similar cases, publication stimulates inquiry and investigation, and there are now numerous observers and collectors in the field, and there are investigators who feel that they should not be compelled to wait longer for our publication. If we do not publish or care to publish what has been brought so far toward completion, it is our duty to announce this to the public that naturalists may no longer feel any restraint in going forward with their work and publication.

If the work can not be published by the State Museum, I would recommend that it be turned over to some institution which will publish it; and I have no doubt there are several institutions in the United States which will gladly undertake the work.

In order to keep up some degree of parity in the progress of discovery among these fossils, I have, especially during the past two years, undertaken, at my own personal expense, to provide for the collecting of Dictyospongiadæ in the southern counties of New York and adjacent parts of Pennsylvania.

In my efforts to retain the advantages which our previous work had given to us, I have been most ably seconded by President Allen of Alfred University, Mrs. Allen and Mr. Alfred Allen, who have spared no pains to aid me in preliminary work and to place in my hands all available material.

Mr. E. B. Hall, of Wellsville, a gentleman personally unknown to me, has taken much interest in this work, and has kindly volunteered his services in searching for these interesting fossils, having already sent me a considerable number of interesting specimens and one new species.

I communicate with this report descriptions of several new species of this family of fossils, with some preliminary remarks.

The preceding communications relate more especially to the work immediately in hand, and work which has been already recommended by the Board of Regents.

The following catalogue of the American species of *ORTHIS*, *SPIRIFERA*, *SPIRIFERINA* and *SYRINGOTHYRIS* has also direct reference to the purposes and progress of Volume VIII, Palæontology of New York, and will be utilized in the completion of that volume.

I have given a continuation and completion of the catalogue of locality record numbers attached to specimens collected for the Palæontology of New York.

I would beg leave to call your attention to the importance of taking some action relative to the geological map of the State of New York so long under consideration, and while so much has already been done for us by the Director of the United States Geological Survey we have accomplished almost nothing in the way of coöperation.

All of which is most respectfully submitted by

Your obedient servant.

JAMES HALL,
State Geologist.

On Syringothyris, Winchell, and its American Species.

[Communicated to Professor James Hall, State Geologist, for his Report of 1889.]
By CHARLES SCHUCHERT.]

A question has often been raised as to what species shall be regarded as the type of the genus *Spirifer*. The first printed notice of this name is given by J. de C. Sowerby, in his *Mineral Conchology*, 1815. The only example cited is the *Anomites cuspidatus*, Martin. In 1814, however, Sowerby read a paper before the Linnean Society, and there mentioned but a single species, the *Anomites striatus*, Martin, which was accepted as the type in England, as well as on the Continent. This paper was published in volume XII of that society's transactions, seven years later, in 1821. One of the universally accepted rules of nomenclature is to admit the date of a species or genus from the first date of publication, which in this case would be to accept *Anomites cuspidatus* as the type of *Spirifer*. So far as I am aware this rule was first formulated and adopted by the British Association in 1842. Therefore it seems to me we can not apply this ruling prior to that date. Sowerby, in distinguishing his genus, based it entirely upon the calcified spiral appendages which were then unknown in any other genus. In this feature either species will answer, and, as Dr. Davidson* has pointed out, that *Anomites striatus* was known as the typical species in Europe, it will be just to Sowerby and to Prof. Winchell to accept this species as the type of *Spirifer*; besides it will create less confusion.

The type of the genus *Syringothyris* is *S. typa*, Winchell. This species, however, has been regarded as identical with the *Anomites cuspidatus*, by such eminent students of Brachiopoda as Dr. Davidson and Prof. King. Yet I believe there are sufficient distinguishing characters to establish both as distinct species. On the other hand I find that *Syringothyris typa*, Winchell, and *Spirifer carteri*, Hall, are synonymous, a point which will be discussed farther on. Should the characters pointed out by me be regarded as sufficient to separate the American species from *Syringothyris cuspidata*, then *S. carteri* must be taken as the type species of *Syringothyris*. If not, then *S. carteri* will become a synonym of *S. cuspidata*, and the latter will stand as the type.

The variability of the transverse plate between the dental lamellæ in the ventral valve is very great, as was shown by Prof. Hall, as early as 1867.* In certain Silurian and Devonian species of *Spirifer* the apical portion between the dental lamellæ is gradually filled up, in Devonian species such as "*S. macronota* and *S. medialis*, Hall, there is a thickened transverse septum [plate] extending from one-third to one-half the length of the fissure from the apex, and this feature is quite independent of the pseudo-deltidium" (Hall, *ibid.*, p. 254). In *S. alta*, Hall, from the Chemung, this transverse plate is well developed and has upon its lower side "a narrow semicylindrical depression, extending to the apex" (*ibid.*, p. 252). It will be seen that as yet we have not a fully developed "canaliferous plate," nor the pointed, inwardly directed extension of this plate. This is first developed in Ohio specimens of *S. carteri*, as found in the Bedford shale, associated with a fauna that has a Hamilton group expression. This is the first species, geologically, known to have the split tube and a punctate shell combined. In the Burlington limestone, however, we have *Spirifer plenius*, Hall, which has a decidedly punctate shell structure, and also the characteristic "twilled cloth" like surface ornamentation. This species has a well developed transverse plate, but not the faintest indication of a depression upon its lower side. This shows that we should not place too much classificatory value upon a punctate structure for species of this genus. In *S. herricki*, n. sp., this tube has become solid and attached to the bottom of the valve, while in an undescribed species from the St. Louis group, two-thirds of the umbonal cavity has become filled up, terminating in a short, thick median septum, above which and originating from the upper portion of this filling is the short split tube.

This canaliferous transverse plate appears to have served for the attachment of the pedicle muscles. Prof. King says†: "Can it have afforded attachment to the capsular [the inner end of the pedicle] muscle? In this case it might be concluded that the canal itself has served as a muscular fulcrum for the *dorsal pedicle muscles*, which ordinarily have one extremity implanted on the intercrural plate of the dorsal valve, and the other attached to the pedicle."

The deltidial covering is regularly convex and smooth for about one-half its length from the apex, then becoming thinner and lamellose, leaving a semicircular opening near the area of dorsal valve. I have seen this covering in *S. carteri* from the Bedford shales of Ohio and the soft shales of the Choteau group of Missouri; in *S. texta* from

* Palæontology, New York, vol. iv, p. 251.

† Annals and Magazine of Natural History, 4 ser., vol. 2, p. 22.

Sciotoville, Ohio; *S. alta*, from the Chemung, and in *S. randalli*, from the Waverly of Pennsylvania.

SYRINGOTHYRIS CARTERI. Hall's sp.

Spirifer carteri, Hall, 1857. Tenth Rep. N. Y. State Cab. Nat. Hist., p. 170.

Spirifer carteri (partim), Meek, 1875. Pal. Ohio, vol. 2, p. 285 (not his figures = *S. texta*, Hall).

Spirifer (*Cyrtia* ?) *hannibalensis*, Swallow, 1860. Trans. St. Louis Acad. Sci., vol. 1, p. 647.

Spirifer cuspidatus? Meek, 1877. U. S. Geol. Expl., 40 Parallel, vol. 4, p. 87, pl. 3, fig. 11 (non Martin).

Syringothyris cuspidatus, Walcott, 1884. Pal., Eureka Dist., p. 219 (non Martin).

Syringothyris cuspidatus (partim), Herrick, 1888. Bull. Denison Univ., vol. 3, p. 41, pl. 1, fig. 7; pl. 2, fig. 17 (not pl. 5, figs. 4-7 = *S. herricki* n. sp.).

Syringothyris typa, Winchell, 1863. Proc. Acad. Nat. Sci., Phil., vol. 15, p. 7.

Syringothyris typa, Winchell, 1870. Proc. Am. Phil. Soc., vol. 12, p. 252.

For syn. of *S. cuspidata*. See Davidson. Mon. Brit. Carb. Brach. 1857.

Spirifer carteri, Hall, has required considerable study on my part to properly understand its generic relations. This has been caused by the poor preservation and crushed condition of the specimens. I have seen nearly 100 individuals, including the types in the American Museum of Natural History in New York City, and know of but two specimens that have both valves in articulation. The best preserved individuals have been kindly loaned me by Prof. W. G. Tight, of Denison University, Granville, Ohio. The two entire specimens show that one has a strongly arched area, due to pressure, and the other, a medium-sized specimen, a very high and almost flat area, measuring an inch and one-quarter in height. Neither of these specimens shows the characteristic transverse plate of Winchell's genus. In seven separated ventral valves, however, I have seen the canaliferous plate and the pointed extension well developed, so that there can be no doubt about *Spirifer carteri* being a true *Syringothyris*. One specimen has shown the peculiar surface markings indicating that the shell was originally punctate.

The variation of the height and curvature of the area of ventral valves is very great, and it is difficult to procure specimens free from compression. Prof. Herrick, who has collected several hundred specimens of this species, writes me that "the ventral area is *very rarely* preserved, and seems absent or small, in many cases, when it really was very large." Comparing the best specimens of *S. carteri* with *S. typa* or *S. hannibalensis*, I can see no differences, other than those due to the sediments or preservation, insufficient to separate them as distinct species. As Prof. Hall's species was published six years

prior to that of Prof. Winchell and three years earlier than that of Prof. Swallow, both the latter become synonyms of *S. carteri*, Hall.

Spirifer carteri, as illustrated by Meek, agrees with *S. texta*, Hall. I have collected that species at Sciotoville, Ohio, the source of Mr. Meek's specimens, and find them to be longer on the hinge-line, with a shorter area compared to the length, than I have ever observed in *Syringothyris carteri*, Hall. The plications are also more numerous; in fact, Sciotoville specimens have shown a greater number than examples of any other species known to me.

Of *Spirifer hannibalensis*, Swallow, from the Choteau group of Marion and Pike counties, Missouri, I have seen seventeen specimens. They are somewhat smaller than *S. typa*, but in other respects agree very well with that species or *S. carteri*. Meek pointed out the close relationship of Swallow's species with *S. typa* and *S. carteri*, while Prof. Herrick was disposed to regard them all equal to *S. cuspidata*, Martin. Several specimens show clearly the canaliferous plate between the dental lamellæ of the ventral valve. The surface of one specimen from the shales at the base of the Choteau group, shows the surface to have been covered with elevated, perforated, closely arranged pustules. Other specimens from which these pustules have been removed by weathering or other causes, have the surface covered by elongated pits, which are the openings of oblique perforations or canals in the shell substance. This last condition is the one generally met with in all our specimens of this genus, and it led Prof. Hall to give the name *Spirifer textus* to a species from the Knobstone group of Indiana, because of its resemblance to "twilled cloth."

Dr. Davidson writes of *Syringothyris typa* as follows:*

"Prof. Winchell discovered in the Carboniferous limestones or Burlington limestone of Burlington, Iowa, a shell indistinguishable in exterior appearance from our British examples of Martin's *Anomites cuspidatus*, and which, from presenting certain peculiar interior arrangements, had led him to propose for that and similarly constructed shells the generic name of *Syringothyris*. To his shell he gave the specific name of *S. typa*, but an attentive examination of his American type with true British examples of *S. cuspidatus* led Professor King to remark, 'It may be safely assumed that *Syringothyris cuspidata* and *S. typa* are one and the same species,' and that 'it will necessarily follow that Martin's specific name, having priority, must be adopted in preference to the one proposed by Prof. Winchell.' I entirely concur in the view taken in this matter by Prof. King, after having compared specimens of the American and British species."

*Supplement to the British Carboniferous Brachiopoda, p. 279.

There is one striking feature, however, that will separate the American species from Irish specimens of *S. cuspidata*. The area of the ventral valve in the first is rarely perfectly flat, it being in nearly all the specimens I have seen, more or less arched. On the contrary, as is shown in the four specimens of the second before me, the area is not arched but reclines, and the beak in each is distinctly deflected to one side. The same peculiarities are also shown in Sowerby's figures,* and Prof. King says,† "instead of being incurved, as is usual [among Palliobranchs], the umbone displays more tendency to the opposite character, or to become *twisted*, like that of *Streptorhynchus*." The plicated portion of the ventral valve in American specimens is always convex, while in the four Irish specimens already mentioned, it is flat or slightly concave. These characters, if constant, certainly should be regarded as of specific value. To determine this point it will be necessary to examine a greater number of specimens than I have been able to study. Under these circumstances I think it advisable to retain Prof. Hall's name, *S. carteri*, as a distinct species from the European *S. cuspidata*, until some one shall prove the features variable.

Spirifer capax, Hall, from the Devonian of Iowa, has often been referred to by authors as another probable synonym of this species. Prof. Calvin‡ has shown that it is the internal cast of *Spirifer parryanus*, Hall. I have seen a number of specimens, none of which have the internal character of the genus *Syringothyris*.

Distribution.—Lower Carboniferous as follows: In the Bedford shale, at Bedford, Ohio; Waverly sandstones of Licking county, Ohio; Choteau group of Marion and Pike county, Missouri; Kinderhook and Burlington groups at Burlington, Iowa. Lower Carboniferous strata of the White Pine Mountains; Richmond Mt.; Eureka District, Nevada, and near Clendenin, Montana.

SYRINGOTHYRIS ANGULATA. Simpson.

Syringothyris angulata, Simpson, 1889. American Philosophical Society, p. 440, figs. 1, 2, 3.

This species is closely related to *S. carteri*, Hall. It holds the same geological position as that species, and may prove to be identical with it. Still it has a somewhat different expression in being smaller, with the hinge extremities drawn out, and having the plications more pronounced and sharper.

Distribution.—Waverly group, near Warren, Pennsylvania.

* Mineral Conchology table, 120.

† Annals and Magazine Natural History, 4 ser., vol. 2, p. 2.

‡ Bulletin Laboratories State University, Iowa, p. 19, 1888.

SYRINGOTHYRIS EXTENUATA. Hall's sp.

Spirifer extenuatus, Hall, 1858. Geol. Surv., Iowa, part 2, p. 520, pl. 7, fig. 6.

Spirifer extenuatus, White, 1875. Geog. & Geol. Expl. & Surv., west 100 Merid., p. 88, pl. 5, fig. 9.

Syringothyris halli, A. Winchell, 1863. Proc. Acad. Nat. Sci., Phil., vol. 15, p. 8.

This species is separated from *S. carteri* by its smaller size, different proportions and by the hinge extremities being pointed, not rounded, as in that species. The sinus is also more defined and deeper.

Dr. C. A. White, in the work above cited, says:

"So far as external characters are concerned, no specific difference can be detected between our shell [*S. extenuata*] and *Syringothyris Halli*, Winchell. His type specimens were obtained from strata of the Kinderhook formation at Burlington, Iowa, and Clarksville, Mo. Those of Prof. Hall were obtained from the same strata at the first-named locality. The want of material difference between the dorsal valve of Prof. Hall's species (the only part of the shell described and figured by him) and the corresponding part of Prof. Winchell's specimens, together with the fact that they are associated in the same strata at one of the typical localities, leaves little cause for doubting the specific identity of *Syringothyris Halli* and *Spirifer extenuatus*."

I believe a larger series of specimens than I possess would show this species to be a young stage of *S. carteri*. *S. typa*, *S. halli* and *S. extenuata* have all been described from material derived from the Kinderhook group at Burlington, Iowa. On the other hand, in Nevada *S. carteri* and *S. extenuata* are never found associated at the same locality.

Distribution.—Lower Carboniferous: In the Kinderhook group at Burlington, Iowa; Battle Creek, Michigan; Clarksville, Missouri, and Mountain Spring, Old Mormon road, Nevada. Waverly sandstone of Licking county, Ohio. ♦

SYRINGOTHYRIS GIGAS. Troost's sp.

Cyrtia gigas, Troost, 1841. Sixth Geological Report, Tennessee, p. 12.

I can add nothing farther to the original description of Prof. Troost, than that its relations are closer to *S. carteri* than to *S. texta*. The original description reads as follows: "I noticed this fossil in my last report under the name of *Spirifer cuspidatus*, Sowerby, because it resembles, more or less, the figure of that fossil in the Manual of De

la Beche. I am now convinced that it can not be the *S. cuspidatus*; it must belong to the genus *Cyrtia*, Dalman, having the *deltidium* and *area* characterizing that genus. This *deltidium*, from its base at the hinge to its apex at the beak, is about two inches. The area or hinge is upwards of four inches in length. It is longitudinally ribbed, and resembles somewhat in figure the *Calceola heterochyta*, Defrance. I believe it is the largest known of that genus."

Found in the "Encrinital stratum near the Harpeth river, Davidson county, Tennessee."

SYRINGOTHYRIS TEXTA. Hall's sp.

Spirifer textus, Hall, 1857. Tenth^h Rep. N. Y. State Cab. Nat. Hist., p. 169.

Spirifer subcuspidatus, Hall, 1858 (non Schnut, 1831). Geol. Surv., Iowa, part 2, p. 646, pl. 20, fig. 5.

Spirifer subcuspidatus, Hall, 1867. Pal., N. Y., vol. 4, p. 249.

Spirifer propinquus, Hall, 1858. Geol. Surv., Iowa, part 2, p. 647.

Spirifer propinquus, Meek and Worthen, 1868. Geol. Surv., Ill., vol. 3, p. 530, pl. 19, fig. 8.

Spirifer cuspidatiformis, S. A. Miller, 1889. North Am. Geol. Pal., p. 372.

The original specimens from which the description was drawn up in 1857, came from the Knobstone group of Indiana and have never been figured. This species is usually met with in collections labeled *S. tupa*, which I have shown to be a synonym for *S. carteri*, Hall. It differs from that species in never having the area of the ventral valve so high, it being almost constantly one inch in height. The length of the hinge-line in *S. tupa* may be twice as great as the length of valves (the most abundant form), or may be equal to it (rather uncommon), while in *S. carteri* the hinge-line is constantly one-half again as long as the length of valves. The sinus is also deeper and often strongly produced into a wave-like extension or tongue, while the fold is more elevated than in *S. carteri*. The plications are also more pronounced. Upon the whole, *S. texta* is a larger and more robust species.

Meek figured this species in 1875, and identified it with *S. carteri*, Hall. His figures show clearly that he had *S. texta* before him, these being longer on the hinge-line, with the area comparatively shorter and with a greater number of plications on each side of the fold and sinus than is known in *S. carteri* from its various localities. I have collected specimens at Sciotoville, Ohio, the source of his illustrated material, and find them to agree with *S. texta* in all characters except one. They have from five to seven plications more on each side of the fold and sinus than I have observed on specimens of this species as found at the original locality in Indiana.

From the Keokuk group of Iowa and Illinois, Prof. Hall has described two species, *Spirifer subcuspidatus* and *Spirifer propinquus*, two varieties which I believe are referable to *S. texta*. Regarding one of these forms, Prof. Hall* said: "So far as I can now determine [*S. textus*] is identical with the one described by me as *S. subcuspidatus*." Specimens of the latter from the typical locality were sent to the late Dr. Davidson, and he regarded them, according to Mr. Meek,† as identical with the *S. cuspidata* of Europe. Specimens are so labeled in the Illinois State collection. I have pointed out above the conspicuous differences between *S. carteri*, *S. cuspidata* and *S. texta*.

Associated with *S. subcuspidata* are specimens which Prof. Hall separated, because of their having "the sinus deeper, the area entirely flat, and the number of plications more numerous," and at that time he had "not observed intermediate forms which will justify the union of this and the preceding species, though they are nearly allied." To these he gave the name *Spirifer propinquus*. Messrs. Meek and Worthen illustrated the original type used by Prof. Hall, and mention having found the characteristic transverse plate and a punctate shell structure. I have seen a number of typical specimens of *S. subcuspidata* and *S. propinqua* from the Keokuk shales of Crawfordsville, Indiana, as well as intermediate specimens which have proven to me the great variability of *Syringothyris texta*. This variability is equally as great, if not greater among the New Providence specimens of which I have had before me no less than twenty specimens.

S. A. Miller, finding the name *S. subcuspidata*, Hall, preoccupied by Schnur, changed it to *S. cuspidatiformis*, which becomes a synonym for *S. texta*, as that species is regarded by me to be identical with the last.

Distribution.—Waverly group, Sciotoville, Ohio. Knobstone group, near New Albany and New Providence, Indiana. Keokuk group, Crawfordsville, Indiana; Keokuk, Iowa; Warsaw and Nauvoo, Illinois.

SYRINGOTHYRIS ALTA. Hall's sp.

Spirifer alta, Hall, 1867. Pal., N. Y., vol. 4, p. 248, pl. 43, figs. 1-7.

Casts of the ventral area of this species from Union City, Pennsylvania, show that the long, narrow deltidium was filled for nearly two-thirds of its length by the transverse plate. The deltidial opening was closed by a lamellose convex covering, extending to within a short distance of the dorsal valve where it left a semicircular opening.

* Palæontology, New York, vol. 4, p. 252. 1867.

† Proceedings Philadelphia Academy Natural Sciences, vol. 9, p. 276.

Artificial casts, made from natural molds of the transverse plate, show it to have upon its lower side a rounded ridge which has no furrow or channel in it, as is the case in *S. carteri*. This ridge is well developed in the umbonal region, in some specimens gradually disappearing towards the inner end of the plate. There is no prolongation into a tube or blunt point.

None of the specimens examined show more than the ventral area, which has the same dimensions as in *Syringothyris carteri*, from Burlington, Iowa.

Prof. Hall illustrates and describes this species as having faint plications upon the fold and sinus which character will separate it at once from all species of this genus except *Syringothyris randalli*, Simpson. That species, however, has a much lower ventral area.

Distribution.—Chemung of Meadville and Union City, etc., Pa. Top of Erie shale at Bedford, Ohio, associated with *Spirifer disjunctus*.

SYRINGOTHYRIS RANDALLI. Simpson.

Syringothyris randalli, Simpson, 1889. American Philosophical Society, p. 441, figs. 1, 2.

This species is closely related to *S. alta*, Hall, in having plications upon the fold and sinus, and these two species are the only ones known to possess this character. They differ, however, by *S. randalli* having a much shorter area and in having the canaliferous plate and prolongation fully developed.

Distribution.—Waverly group (Chemung group on the authority of Mr. F. A. Randall) of Warren and Erie counties, Pennsylvania.

SYRINGOTHYRIS HERRICKI. n. sp.

Syringothyris cuspidatus, Herrick, 1888 (partim). Bulletin Denison University, vol. 3, pl. 5, figs. 4-7 (non pl. 1, fig. 7, and pl. 2, fig. 17).

In a very soft yellow sandstone, occurring in the Waverly group of Ohio, a species of *Syringothyris* has been found and figured by Prof. Herrick as *S. cuspidatus*. The specimens I have seen are ventral valves and show no compression. Externally they differ from *S. cuspidata* or *S. carteri*, in having the ventral area strongly arched and short, with the beak strongly incurved. The ventral valve is also more gibbous. The peculiarity of these specimens, in which they differ from all other species of this genus known to me, lies in the transverse plate between the dental plate of the ventral valve. This plate, in typical species of this genus, is prolonged into a split tube. In this species there is attached to and beneath this plate a large, solid process, directed inward and downward, broadly rounded on the

top, rapidly contracting to a furrow upon each side, and then extending as a septum to the bottom of the valve. It has the appearance as if the split tube had joined and formed a septum. Shell structure undetermined.

The name is proposed out of regard for Prof. C. L. Herrick, now at the University of Cincinnati, who gave the first illustration of the peculiar interior appendage.

SYRINGOTHYRIS ? PLENA. Hall sp.

Spirifer plenus, Hall, 1858. Geol. Surv., Iowa, vol. 1, part 2, p. 603, pl. 13, fig. 4.

I have seen thirteen specimens of this species and find them remarkably constant. They possess the external characters of *Syringothyris*, having a well-defined unplicated sinus and fold, shell structure distinctly punctate and with the characteristic textile markings found upon species of this genus. The ventral area is broad and strongly arched, differing in this respect from all species of *Syringothyris*, except *S. herricki*, from which it differs internally. The interior of the ventral valve has two strong dental lamellæ, which extend nearly to the front margin. The extension of these lamellæ is characteristic of this species, and they are not half as long in any other species of *Spirifer*. The fissure is almost completely filled by the transverse plate, but I could not see any indication of the canal or the pointed termination of the plate. I place this species provisionally in the genus *Syringothyris*.

Distribution.—Burlington limestone, at Burlington, Iowa; Quincy, Illinois, and Pike county, Missouri.

List of Species of the American Palæozoic Orthis, Spirifera, Spiriferina and Syringothyris.

[Copied from the manuscript catalogue of "American Fossil Brachiopoda" of Mr. Charles Schuchert. Communicated for the report of the State Geologist for 1889.]

ORTHIS, Dalman.

- O. ? acuminata*, Billings, 1859. Chazy.
- O. (Platystrophia) acuminata*, U. P. James, 1878. Hudson.
- O. (Platystrophia) acutilirata*, Conrad, 1842. Hudson River.
- O. acutiloba*, Ringueberg, 1888 = *Bilobites biloba*, Linnæus.
- O. æquivalvis*, Hall, 1847 (non Davidson, 1847). Trenton and Hudson River.
- O. æquivalvis*, Hall, 1857 (non 1847 or 1858). Syn. for *O. eryna*, Hall.
- O. æquivalvis*, Hall, 1858 (non 1847 or 1857) = *Streptorhynchus æquivalvus*.
- O. æquivalva*, Shaler (non Hall or Davidson). Syn. for *O. uberis*, Bill.
- O. alata*, Shaler, 1865. Syn. for *O. Davidsoni*, De Verneuil.
- O. alternans*, Castlenau, 1843 (= ? *Streptorhynchus*).
- O. alsus*, Hall, 1863. Schoharie grit.
- O. amœna*, N. H. Winchell, 1880. Hudson River.
- O. anticostiensis*, Shaler. Syn. for *O. porcata*, McCoy.
- ? *O. apicalis*, Billings, 1865. Quebec group.
- O. arachnoides*, Roemer, 1852, and Hall, 1857, = *Streptorhynchus arachnoideus*, Phillips.
- ? *O. armanda*, Billings, 1865. Quebec.
- O. assimilis*, Hall, 1859. Lower Helderberg.
- O. aurelia*, Billings, 1874. Gaspé limestone.
- ? *O. barabuensis*, A. Winchell, 1864. Potsdam.
- O. battis*, Billings, 1865. Quebec.
- O. bellarugosa*, Conrad, 1843. Trenton and Galena.
- O. bellula* (James) Meek, 1873. Hudson River.
- O. bicostatus*, Vanuxem, 1842 = *Spirifera bicostata*.
- ? *O. billingsi*, Hartt, 1868. Cambrian.
- O. [Bilobites] biloba*, Linne. Niagara.

O. bilobata [Delthyris bilobata, Conrad, 1838]. Syn. for *O. varica*, Conrad.

O. bisulcata, Emmons, = ? *Camarella bisulcata*.

O. borealis, Billings, 1859. Chazy to Trenton.

O. buchii D'Orbigny, 1842. Carboniferous of South America.

O. canalis, Hall, 1843. Syn. for *O. elegantula*, Dalman.

O. carbonaria, Swallow. Syn. for *O. pecosi*, Marcou.

O. carinata, Hall, 1843. Chemung.

O. carleyi, Hall, 1860. Syn. for *O. retrorsa*, Salter.

? *O. centrilineata*, Hall, 1847. Loraine.

O. centrosa, S. A. Miller, 1889. Syn. for *O. (Platystrophia) crassa*, James.

O. charlottæ, N. H. Winchell, 1880. Trenton.

O. cincinnatiensis, Miller, 1883. Hudson River.

O. circularis, N. H. Winchell, 1880 (non Sowerby). Trenton.

O. circulus, Hall, 1843. Clinton.

O. clarkensis, Swallow, 1863. Keokuk.

O. cleobis, Hall, 1863. Onondaga.

O. clytie, Hall, 1861. Trenton.

? *O. coloradoensis*, Shumard, 1860. Potsdam.

O. coloradoensis, Meek, 1870 (non Shumard). Syn. for *O. desmopleura*, Meek.

O. concinna, Hall, 1859. Lower Helderberg.

O. conradi, Castelnau, 1843. Syn. for *Hipparionyx proximus*, Vanuxem.

O. conradi, N. H. Winchell, 1880. Trenton.

O. cooperensis, Swallow, 1863. Warsaw.

O. cora, D'Orbigny, 1842. Carboniferous of South America.

O. corinna, Billings, 1865. Quebec.

O. costalis, Hall, 1847. Chazy.

O. costuta, Hall, 1845 [non Sowerby, 1839]. Syn. for *O. cincinnatiensis*, Miller.

O. [Platystrophia] crassa, James, 1874. Hudson River.

O. crispata, Emmons, 1842. Loraine.

O. cumberlandia, Hall, 1859. Oriskany.

O. cuneata, Owen, 1852. Hamilton.

O. cyclas, Hall, 1860. Marcellus to Hamilton.

O. cyclus, James, 1874. Syn. for *O. multisecta* [James] Meek.

O. (Platystrophia) cypha, James, 1874. Hudson.

O. dalyana, Miller, 1881. Burlington.

O. davidsoni, Dé Verneuil, 1840. Mid. Sil. and Niagara.

O. daytonensis, Foerste. Clinton.

- O. deformis*, Hall, 1857 = *Streptorhynchus deformis*, Hall.
O. delicatula, Billings, 1865. Quebec.
O. dentata, Meek, 1873 (non Pander). Syn. for *O. (P.) crassa*, James.
O. desmopleura, Meek, 1870. Lower Silurian.
O. dichotoma, Hall, 1847. Hudson River.
O. discus, Hall, 1859. Lower Helderberg.
O. disparilis, Conrad, 1843. Syn. for *O. tricenaria*, Conrad. *O. disparilis* being the young of *O. tricenaria*, it will be better to adopt the latter name, although the former was first described in the same article.
O. dubia, Hall, 1858. Keokuk, Warsaw and St. Louis.
O. eboracensis, S. A. Miller, 1889. Syn. for *O. lentiformis*, Hall.
O. electra, Billings, 1862. Quebec.
O. elegantula, Dalman, 1827. Clinton to Niagara.
O. elegantula var. *parva*, Foerste, 1885. Clinton.
O. ella, Hall, 1861. Hudson River.
O. emacerata, Hall, 1860. Hudson River.
O. emacerata, Meek, 1873 (non Hall). Syn. for *O. meeki*, Miller.
O. emarginata. See *O. oblata* var. *emarginata*.
O. eminens, Hall, 1859. Lower Helderberg.
O. erratica, Hall, 1847 = *Zygospira erratica*, Hall.
O. eryna, Hall, 1863. Corniferous.
O. eudocia, Billings, 1862. Quebec.
O. eurekensis, Walcott, 1884. Cambrian.
O. euryone, Billings, 1862. Quebec.
O. evadne, Billings, 1862. Birdseye.
O. fasciata, Hall, 1852 = ? *Orthostrophia fasciata*.
O. fausta, Foerste, 1885. Clinton.
O. fissicosta, Hall, 1847. Hudson River.
O. fissiplica, Roemer, 1860. Niagara.
O. flabellulum, Sowerby, 1839. Niagara.
O. flava, A. Winchell, 1865. Kinderhook.
O. gemmicula, Billings, 1862. Quebec.
O. gibbosa, Billings, 1857. Chazy to Trenton.
O. goodwini, Nettelroth, 1889. Hamilton.
O. halli, Safford, 1869. This may be equal to *Orthis strophomenoides*, Hall = *Orthostrophia strophomenoides*.
O. hamburgensis, Walcott, 1884. Pogonip.
O. harttii, Rathbun, 1879. Mid. Devonian of South America.
? *O. highlandensis*, Walcott, 1886. Mid. Cambrian.
O. hipparionyx, Hall, 1859 = *Hipparionyx proximus*, Vanuxem, 1842.
O. hippolyte, Billings, 1862. Quebec.

- O. hybrida*, Sowerby, 1839. Niagara.
- O. humboldtii*, D'Orbigny, 1842. Silurian of South America.
- O. huroniensis*, Castelnau, 1842. Syn. for *Strophomena alternata*, Conrad, 1838.
- O. idas*, Hall, 1867. Syn. for *O. eryna*, Hall.
- O. idonea*, Hall, 1867. Hamilton.
- O. imperator*, Billings, 1859. Chazy.
- O. impressa*, Hall, 1843. Portage and Chemung.
- O. inæqualis*, Hall, 1858. This has been regarded by Professor Hall as a syn. for *Streptorhynchus chemungensis*, Conrad.
- O. inca*, D'Orbigny, 1842. Devonian of South America.
- O. infera*, Calvin, 1878. Hamilton.
- O. insculpta*, Hall, 1847. Hudson River.
- O. insignis*, Hall, 1859 = *Scenidium insigné*.
- O. interlineata*, D'Archiac and DeVerneuil, 1842, and Hall, 1843 (non Sowerby). Syn. for *O. tioga*, Hall.
- O. interstriata*, Hall, 1852 = *Streptorhynchus interstriatum*.
- O. iowensis*, Hall, 1858. Hamilton, Chemung and ? Marshall.
- O. iowensis* var. *furnarius*, Hall, 1858. Hamilton.
- O. iphigenia*, Billings, 1862. Trenton.
- O. jamesi*, Hall, 1861. Hudson River.
- O. jugosa*, James, 1879. Syn. for *O. meeki*, S. A. Miller.
- O. kankakensis*, McChesney, 1861. Hudson River.
- O. kaskaskiensis*, McChesney, 1860 = *Streptorhynchus kaskaskiensis*.
- O. kassubæ*, N. H. Winchell, 1880. Trenton.
- O. kennicotti*, McChesney, 1861. Syn. for *O. retrorsa*, Salter.
- O. keokuk*, Hall, 1858 = *Derbya keokuk*.
- O. lasallensis*, McChesney, 1860. Syn. for *Derbya crassa*, Meek and Hayden sp.
- O. laticostata*, D'Orbigny, 1842. Devonian of South America.
- O. [Platystrophia] laticostata* [James,] Meek, 1873. Hudson River.
- ? *O. laurentina*, Billings, 1857. Mid. Silurian.
- O. lenticularis*, Vanuxem, 1842 (non Wahlenberg, 1821). Syn. for *O. lentiformis*, Hall.
- O. lentiformis*, Hall, 1843. Corniferous. *O. lenticularis* and *O. lentiformis* were used by Professor Hall for the same species in his Geol. Rep., Fourth Dist., N. Y., p. 175. As Vanuxem's name is preoccupied, I shall use *O. lentiformis*, Hall, for that species.
- O. leonensis*, Hall, 1867. Syn. for *Orthis tenuilineata*, Hall.
- O. lepida*, Hall, 1860. Hamilton.
- O. lepis*. Identified by D'Archiac and DeVerneuil, 1842, as occurring in Kentucky. Not recognized since.

- O. leptænoides*, Emmons, 1842. Trenton.
- O. leucosia*, Hall, 1860. Hamilton.
- O. limitaris*, Vanuxem, 1842 = *Leiorhynchus limitaris*.
- O. ? linneyi*, James, 1881 = *Rhynchonella linneyi*.
- O. livia*, Billings, 1860. Corniferous.
- O. lonensis*, Walcott, 1884. Pogonip.
- O. lucia*, Billings, 1874. Gaspé limestone.
- O. [Platystrophia] lynx*, Eichwald, 1830. Trenton to Niagara.
- O. maria*, Billings, 1862. Hudson River to Mid. Silurian.
- O. macfarlanii*, Meek, 1868. Hamilton.
- O. macleodi*, Whitfield, 1889. Calciferous.
- O. media*, Shaler, 1865. Mid. Silurian.

O. media, N. H. Winchell, 1880. Trenton. This species is probably equal to *O. gibbosa*, Billings. Moreover, the name is preoccupied by Shaler.

O. meeki, Miller, 1875. Hudson River.

? *O. merope*, Billings, 1862. Trenton to Hudson River. This species will probably prove to be a *Scenidium*.

O. michelini, L'Eveille, 1835. Waverly to Burlington.

O. michelini, var. Meek, 1877. Syn. for *O. nevadensis*, Meek.

O. michelini var. *burlingtonensis*, Hall, 1858. Syn. for *O. michelini* L'Eveille.

? *O. minna*, Billings, 1865. Quebec.

O. minneapolis, N. H. Winchell, 1880. Trenton. This species will very likely prove to be equal to *O. subæquata*, Conrad.

O. missouriensis, Shumard, 1855. Cape Girardeau limest.

O. missouriensis, Swallow, 1860. Choteau. This species is quite distinct from Shumard's, and closely related to *O. michelini*, L'Eveille. It is not advisable to give it another name until we know more of Shumard's species.

O. mitis, Hall, 1863. Schoharie grit.

O. ? morganiana, Derby, 1874. Carboniferous of South America.

O. morrowensis, James, 1874. Hudson River.

O. multisecta [James], Meek, 1873. Hudson River.

O. multistriata, Hall, 1859. Lower Helderberg.

O. musculosa, Hall, 1857. Oriskany.

O. mycale, Billings, 1862. Quebec.

O. nettoana, Rathbun, 1874. Middle Devonian of South America.

O. nevadensis, Meek, 1877. Sub-Carboniferous.

O. neglecta, James, 1879. Syn. for *O. dichotoma*, Hall, 1847.

O. nisis, Hall and Whitfield, 1872. Niagara.

O. nucleus, Hall, 1843. Syn. for *Ambocoelia umbonata*.

O. oblata, Hall, 1859. Lower Helderberg.

O. oblata var. *emarginata*, Hall, 1859. Lower Helderberg.

O. occasus, Hall, 1860. Kinderhook.

O. occidentalis, Hall, 1847. Hudson River.

O. orbicularis, Sowerby. This species was identified in New York by d'Archiac and d'Verneuil in 1842. It has not been recognized by American authors.

O. orthambonites, "Pander species." Identified by Billings as occurring in the Quebec group at Point Lévis.

Pander did not describe an *Orthis orthambonites*, but did describe several species of *Orthambonites*. Murchison and De Verneuil have figured an *Orthis calligramma* var. *orthambonites* with which Billings identified his Canadian specimens. These figures of the Russian species show fine radiating lines upon the plications which is not the case with Canadian specimens. Von Buch has described *Orthis orthambonites* with which Billings' figures should be compared; if distinct, it will be necessary to give Billings' species another name.

O. parva, De Verneuil species. Doubtfully identified by Billings in 1866 as occurring in the Anticosti group.

O. pecosi, Marcou, 1858. Upper Carboniferous.

O. pectinatus, D'Orbigny, 1842. Devonian of South America.

O. pectinella [Conrad mss.], Emmons, 1842. Trenton.

O. pectinella var. *semiovalis*, Hall, 1847. Trenton.

O. peduncularis, Hall, 1859. Lower Helderberg.

O. peloris, Hall, 1863. Schoharie grit.

O. penelope, Hall, 1860. Hamilton.

O. penniana, Derby, 1874. Carboniferous of South America.

O. pennsylvanica, Simpson, 1889. Chemung.

O. pepina, Hall, 1863 = *Orthisina pepina*.

O. perelegans, Hall, 1857. Lower Helderberg.

O. perversa, Hall, 1857 = *Streptorhynchus perversum*.

O. perveta, Conrad, 1843. Chazy to Trenton.

? *O. pigra*, Billings, 1859. Chazy.

O. pisum, Hall, 1852. Syn. for *Nucleospira pisiformis*, Hall.

O. planoconvexa, Hall, 1859. Lower Helderberg and Oriskany.

? *O. platys*, Billings, 1859. Chazy.

O. plicata, Vanuxem, 1842. Syn. for *Spirifera vanuxemi*, Hall.

O. plicifera, [Leptaena plicifera Hall, 1847]. Chazy.

O. plicatella, Hall, 1847. Trenton to Hudson River.

O. pogonipensis, Hall and Whitfield, 1877. Chazy.

O. porcata, McCoy, 1846. Trenton and Mid. Silurian.

O. porcia, Billings, 1859. Chazy.

- O. pratteni*, McChesney, 1860 = *Streptorhynchus pratteni*.
O. præumbona, Hall, 1857 = *Ambocœlia præumbona*.
O. pravus, Hall, 1858. Syn. for *Streptorhynchus chemungensis*, Conrad.
O. propinqua, Hall, 1857. Upper Helderberg.
O. punctostriata, Hall, 1852. Niagara.
O. pyramidalis, Hall, 1852 = *Scenidium pyramidale*.
? *O. quacoensis*, Matthew, 1886. Cambrian.
O. quadrans, Hall, 1859. Lower Helderberg.
O. quadricostata, Vanuxem, 1842 = *Leiorhynchus quadricostatum*.
O. remnicha, N. H. Winchell, 1886. St. Croix.
O. resupinata, Hall, 1843 (non Martin). Syn. for *O. tulliensis*, Vanuxem.
O. resupinata, Martin species. Sub-Carboniferous. Identified by Hall and Whitfield, 1887, and S. A. Miller, 1881.
O. resupinata var *latirostrata* (Toula), Derby, 1874. Carboniferous of South America. Probably identical with *O. cora* d'Orbigny.
O. resupinoides, Cox, 1857. Upper Carboniferous.
O. retrorsa, Salter, 1858. Trenton to Hudson River.
O. rhynchonnelliformis, Shaler, 1865. Anticosti.
O. richmonda, McChesney, 1860. Syn. for *Derbya crassa*, Meek and Hayden species.
O. robusta, Hall, 1858 = *Derbya robusta*.
O. rugiplicata, Hall and Whitfield. Niagara.
O. ruida, Billings, 1866. Anticosti.
O. salemensis, Walcott, 1887. Lower Cambrian.
? *O. sandbergi*, N. H. Winchell, 1866 = ? *Triplesia sandbergi*.
O. schohariensis, Castelnau, 1843 = *Strophonella schohariensis*.
O. scovillii, Miller, 1882. Hudson River.
O. sectostriata, Ulrich, 1879. Hudson River.
O. semele, Hall, 1863. Onondaga.
O. (Platystrophia) sheppardi, Castelnau sp. (*Spirifer sheppardi*).
? *Galena*.
O. sinuata, Hall, 1847. Hudson River.
O. sola, Billings, 1866. Anticosti.
O. solitaria, Hall, 1860. Hamilton.
O. stonensis, Safford, 1869. Trenton.
O. striatula, Schlotheim species, 1813. Davidson mentions this species occurring in the United States. He probably had reference to *O. propinqua*, Hall.
O. striatula, Emmons, 1842 (non Schl.). Syn. for *O. testudinaria*, Dalman.

- O. strophomenoides*, Hall, 1857 = *Orthostrophia strophomenoides*.
O. subæquata, Conrad, 1843. Trenton.
O. subcarinata, Hall, 1857. Lower Helderberg.
O. subcircula, Simpson, 1889. Clinton.
O. subelliptica, White and Whitfield, 1862. Kinderhook.
O. subjugata, Hall, 1847. Syn. for *O. occidentalis*, Hall.
O. subnodosa, Hall, 1879. Niagara.
O. suborbicularis, Hall, 1858. Hamilton.
O. subquadrata, Hall, 1847. Hudson River.
O. subumbona, Hall, 1857 = *Spirifera subumbona*.
O. swallovi, Hall, 1858. Burlington. This species agrees in all characters, except size, with *O. resupinata* (Martin's species) as figured by Davidson.
O. sweeneyi, N. H. Winchell, 1881. Trenton.
O. tenuidens, Hall, 1852. Clinton.
O. tenuilineata, Hall, 1843 [*Atrypa* ? *tenuilineata*]. Chemung.
? *O. tenuistriata*, Hall, 1843. Portage. This is not an *Orthis*; probably a *Lamellibranch*.
O. testudinaria, Dalman, 1827. Trenton to Hudson River.
O. thiemii, White, 1860. Chemung and Kinderhook.
O. tioga, Hall, 1867. Portage and Chemung.
O. tricenaria, Conrad, 1843. Trenton. See *O. disparilis*.
O. trinucleus, Hall, 1852. Clinton.
O. triplicatella, Meek, 1872. Hudson River.
O. tritonia, Billings, 1862. Quebec.
O. tubulostriata, Hall, 1857. Lower Helderberg.
O. tulliensis, Vanuxem, 1842. Tully.
O. uberis, Billings, 1866. Anticosti.
O. umbonata, Conrad, 1842 = *Ambocelia umbonata*.
O. umbraculum, Owen, 1852, Hall, 1858 (non von Buch). Syn. for *Derbys keokuk*, Hall.
O. unguiculus, Hall, 1843 (non Phillips). Syn. for *Ambocelia gregaria*, Hall.
O. unguiformis, Castelnau, 1843 and Emmons, 1860. Syn. for *Hipparionyx proximus*, Vanuxem.
O. vanuxemi, Hall, 1857. Corniferous to Hamilton.
O. vanuxemi var. *pulchella*, Herrick, 1888. Middle Waverly.
O. [Bilobites] varica, Conrad, 1842. Lower Helderberg.
O. whitfieldi, N. H. Winchell, 1881. Hudson River.

The families of *Strophomenidæ* and *Productidæ* have not yet been sufficiently determined in their relations to each other, or to other

families to suggest any satisfactory grouping of the genera in their natural relations to each other. This can scarcely be accomplished in a satisfactory manner until we have more extensive collections for study.

J. H.

SPIRIFERA, Sowerby.

- S. acanthoptera*, Conrad, 1842. Hamilton.
S. acuminata, Conrad, 1839. Corniferous and Hamilton.
S. acuticostata, De Koninck species. Identified as occurring in the Permo-Carboniferous of Nova Scotia by Sir William Dawson.
S. agelaia, Meek, 1873. Carboniferous,
S. alatus, Castelnau, 1843, non Schlotheim. Syn. for *S. arenosa*, Conrad.
S. alabapinensis, Hall & Whitfield, 1877. Kinderhook.
S. alceformis, De Verneuil, 1843. Syn. for *S. arenosa*, Conrad.
S. aldrichi, Etheridge, 1878. Devonian.
S. alta, Hall, 1867 = *Syringothyris alta*.
S. amara, Swallow, 1860. Choteau.
S. angusta, Hall, 1857. Hamilton and Portage.
S. annæ, Swallow, 1860. Hamilton.
S. annectans, Walcott, 1884. Carboniferous.
S. arata, Hall, 1857. Syn. for *S. granulifera*.
S. arctica, Haughton, 1857. Devonian.
S. arctisegmenta, Hall, 1857. Upper Helderberg.
S. arenosa, Conrad, 1839. Oriskany and Corniferous.
S. argentaria, Meek, 1877. Syn. for *S. pinonensis*, Meek.
S. arrecta, Hall, 1859. Oriskany.
S. aspera, Hall, 1858. Hamilton.
S. asperata, Ringueberg, 1886. Niagara.
S. atwaterana, Miller. Syn. for *S. ligus*, Owen.
S. audacula, Conrad, 1842. Marcellus and Hamilton.
S. belphegor, Clarke, 1885. Genesee.
S. bialveata, Conrad, 1842. Syn. for *S. radiata*, Sowerby.
S. bicostata, Vanuxem, 1842. Niagara.
S. bicostata var. *petila*, Hall. Niagara.
S. bidorsalis, A. Winchell, 1866. Hamilton.
S. biforata var. *lynx*, Hall, 1852; = *Orthis* (*Platystrophia*) *lynx*, Eichwald.
S. bifurcata, Hall, 1857. ? Syn. for *S. leidy*, Norwood and Pratten.
S. billingsana, S. A. Miller, 1889. Devonian.
S. biloba, Hall, 1852 = *Orthis* (*Bilobites*) *biloba*, Linne.
S. bimesialis, Hall, 1858. Hamilton and Chemung.
S. biplicata, Hall, 1858. Kinderhook.

- S. boliviensis*, D'Orbigny, 1842. Devonian of South America.
S. boonensis, Swallow, 1860. Lower Coal Measures.
S. buarquiana, Rathbun, 1879. Middle Devonian of South America.
S. byrnesi, Nettelroth, 1889. Hamilton.
S. camerata, Morton, 1836. Upper Carboniferous.
S. camerata var. *kansasensis*, Swallow, 1866. Up. Carb. Meek did not regard this variety as well established, while C. A. White recognizes it.
S. camerata var. *percrassa*, Swallow, 1866. Up. Carb.
S. capax, Hall, 1858. Syn. for *S. parryana*, Hall.
S. carteri, Hall, 1857 = *Syringothyris carteri*.
S. carteri, Meek, 1875 (non Hall). Syn. for *Syringothyris texta*, Hall.
S. catskillensis, Emmons, 1860. Syn. for *S. mesastrialis*, Hall.
S. cedarensis, Owen, 1852. Hamilton.
S. centronata, A. Winchell, 1865. Waverly.
S. clara, Swallow, 1863. Chester.
S. clavatula, McChesney, 1861. Burlington.
S. clintoni, Hall, 1857. Syn. for *S. granulifera*, Hall.
S. clio, Hall, 1860. Syn. for *S. consobrina*, D'Orbigny.
S. compacta, Meek, 1868. Devonian.
S. concinna, Hall, 1857. Lower Helderberg.
S. condor, D'Orbigny, 1842. Carboniferous of South America.
S. conradana, Miller, 1883. See *S. fimbriata*, Conrad.
S. consobrina, D'Orbigny, 1850. Hamilton.
S. consors, A. Winchell, 1866. Hamilton.
S. cooperensis, Swallow, 1860. Kinderhook.
S. corticosa, Hall, 1857. Hamilton.
S. costalis, Castelnau, 1843. Probably a species of *Cyrtina*.
S. crispa, Hisinger, 1826. Niagara and Coralline limest.
S. crispa var. *simplex*, Hall, 1863. Niagara.
S. cumberlandia, Hall, 1857. Oriskany.
S. cuspidatiformis, S. A. Miller, 1889. Syn. for *S. texta*, Hall.
S. cuspidata, Martin species = *Syringothyris cuspidata*.
S. cycloptera, Hall, 1857. Lower Helderberg.
S. cyrtiniformis, Hall and Whitfield, 1872. Hamilton.
S. davisi, Nettelroth, 1889. Hamilton.
S. decemplicata, Hall, 1843. Syn. for *S. sulcata*, Hisinger.
S. deltoidea, Herrick, 1888. Waverly.
S. desiderata, Walcott, 1884. Lower Carboniferous.
S. disjuncta, Sowerby, 1840. Chemung.
S. disparilis, Hall, 1857. Corniferous.
S. divaricata, Hall, 1857. Corniferous and Hamilton.

- S. dubia*, Hall, 1860 = *Pentamerella dubia*.
S. dubia, Nettelroth, 1889. ?Niagara.
S. duodenaria, Hall, 1843. Upper Helderberg.
S. duplicata, Conrad, 1842. Hamilton. This will very likely prove to be a syn. for *S. granulifera*, Hall = *S. granulosa*, Conrad.
S. duplicata, Hall, 1867 = *S. duplicata*, Conrad, 1842.
S. eatoni, Hall, 1857. Syn. for *S. audacula*, Conrad.
S. elizæ (Hartt) Rathbun, 1874. Mid. Devonian of South America.
S. engelmanni, Meek and Worthen, 1868 (non Meek). Syn. for *S. wortheni*, Meek (non Hall). See *S. worthenana*, n. sp.
S. engelmanni, Meek, 1860. Mid. Devonian.
S. eudora, Hall, 1861. Niagara.
S. euruteines, Owen, 1844. Hamilton.
S. eurutines var. *fornacula*, Hall, 1857. Hamilton.
S. extenuata, Hall, 1858 = *Syringothyris extenuata*.
S. fasciger, Owen, 1852 (non Keyserling). Syn. for *S. camerata*, Morton.
S. fastigata, Morton, 1836. Coal Measures.
S. fastigata, Meek and Worthen, 1870 (non Morton). Syn. for *S. mortonana*. Miller.
S. filicosta, A. Winchell, 1866. Hamilton.
? *S. fimbriata*, Morton, 1836. Coal Measures.
S. fimbriata, Conrad, 1842. Oriskany to Hamilton. As this name was preoccupied by Morton, Mr. S. A. Miller has proposed *S. conradana* to take its place. This name can scarcely be accepted, as Morton's species may not be a *Spirifera*.
S. fischeri, Castelnau, 1843. Syn. for *S. macropleura*, Conrad.
S. foggi, Nettelroth, 1889. Niagara.
S. forbesi, Norwood and Pratten, 1854. Burlington.
S. formosa, Hall, 1857. Hamilton.
S. fornacula, Meek and Worthen, 1868 (non Hall). Syn. for *S. parryana*, Hall.
S. fornacula, Hall, 1857 = *S. eurutines*, var. *fornacula*.
S. fornax, Hall, 1857. Hamilton.
S. franklini, Meek, 1869. Devonian.
S. fultonensis, Worthen, 1873. Coal Measures.
S. gaspensis, Billings, 1874. Gaspé.
S. gibbosa, Hall, 1861. Niagara.
S. glabra, Martin species. Occurs in the coal measures of Nova Scotia according to Dawson.
S. glabra var. *contracta*, Meek and Worthen, 1861. Chester.
S. glabra var. *nevadensis*, Walcott, 1884. Upper Devonian.

- S. glanscerasi*, White, 1862. Hamilton.
S. granulifera, Hall, 1843. Syn. for *S. granulosa*, Conrad.
S. granulosa, Conrad, 1839. Hamilton.
S. gregaria [Clapp mss.], Hall, 1857. Upper Helderberg.
S. grieri, Hall, 1857. Schoharie grit and Corniferous.
S. grimesi, Hall, 1858. Burlington.
S. guadalupensis, Shumard, 1859. Upper Carboniferous.
S. [Cyrtia ?] hannibalensis. Swallow, 1860 = *Syringothyris carteri*, Hall.
S. harttii, Rathbun, 1879. Middle Devonian of South America.
S. hemicycla, Meek and Worthen, 1868. Oriskany.
S. hemiplicata, Hall, 1852 = *Syntrielasma hemiplicatum*.
S. hesione, Billings, 1863. Syn. for *S. raricosta*, Conrad.
S. heteroclitus, Marcou. Syn. for *S. granulosa*, Conrad.
S. hirtus, White and Whitfield, 1862. Kinderhook.
S. hobbsi, Nettelroth, 1889. Hamilton.
S. hungerfordi, Hall, 1858. Chemung. ?
S. huronensis, A. Winchell, 1862. Huron.
S. huroniensis, Castelnau, 1843. Syn. for *S. granulosa*, Conrad.
S. imbrex, Hall, 1858. Burlington.
S. inæquicostatis, Owen, 1852. Syn. for *S. camerata*, Morton.
S. inæquivalvis, Castelnau, 1843 = *Rhynchonella inæquivalvis*.
S. incerta, Hall, 1858. Burlington.
S. inconstans, Hall, 1861. Syn. for *S. nobilis*, Barrande.
S. increbescens, Hall, 1858. Chester.
S. increbescens var. *americana*, Swallow, 1866. Chester.
S. increbescens var. *transversalis*, Hall, 1858. Chester.
S. insolita, A. Winchell, 1862. Huron.
S. intermedia, Hall, 1859 (non Brongniart, 1829). Oriskany.
S. inutilis, Hall, 1858. Hamilton.
S. iowensis, Owen, 1852. Hamilton.
S. kelloggi, Swallow, 1863. Keokuk.
S. kennicotti, Meek, 1868. Hamilton.
S. kentuckiensis, Shumard, 1855 = *Spiriferina kentuckiensis*.
S. kentuckiensis var. *propatula*, Swallow, 1866 = *Spiriferina kentuckiensis* var. *propatula*.
S. keokuk, Hall, 1858. Keokuk.
S. keokuk var. *shelbyensis*, Swallow, 1866. Warsaw.
S. knappiana, Nettelroth, 1889. Corniferous.
S. lævigata, Swallow, 1863. Keokuk.
S. lævis, Hall, 1843. Portage.
S. lateralis, Hall, 1858. Warsaw.

- S. latior*, Swallow, 1863. Choteau.
S. leidy, Norwood and Pratten, 1855. St. Louis.
S. leidy var. *chesterensis*, Swallow, 1866. Chester.
S. leidy var. *merimacensis*, Swallow, 1866. Warsaw.
S. ligus, Owen, 1852. Hamilton.
S. lineatoides, Swallow, 1860. Burlington.
S. lineata of American authors (non Martin). Syn. for *S. perplexa*, McChesney.
S. lineata var. *striatolineata*, Swallow, 1866. Up. Coal Meas.
S. littoni, Swallow, 1860. St. Louis.
S. logani, Hall, 1858. Keokuk.
S. lyelli, De Verneuil, 1843. Syn. for *S. mucronata*.
S. macbridei, Calvin, 1883. Hamilton.
S. macconathii, Nettelroth, 1889. Hamilton.
S. macra, Hall, 1857. Schoharie grit and Corniferous.
S. macra, Meek, 1860. Syn. for *S. strigosa*, Meek.
S. macronota, Hall, 1843. Hamilton.
S. macropleura, Conrad, 1840, and Castelnau, 1843. Lower Helderberg.
S. macrothyris, Hall, 1857. Upper Helderberg.
S. mæcuruensis, Rathbun, 1879. Middle Devonian of South America.
S. maia, Billings, 1860. Corniferous.
S. manni, Hall, 1857. Upper Helderberg.
S. marcoui, Waagen, 1883. Upper Carboniferous.
S. marcyi, Hall, 1857. Hamilton.
S. marionensis, Shumard, 1855. Choteau and Waverly.
S. medialis, Hall, 1843. Syn. for *S. audacula*, Conrad.
S. meeki, Swallow, 1860. Burlington.
S. meristoides, Meek, 1868. Devonian.
S. mesacostalis, Hall, 1843. Chemung.
S. mesastrialis, Hall, 1843. Hamilton, Portage, Chemung.
S. meta, Hall, 1867. Clinton, Niagara.
S. meusebachanus, Roemer, 1852. Syn. for *S. camerata*, Morton.
S. mexicana, Shumard, 1858. Upper Carboniferous.
S. missouriensis, Swallow, 1860. Choteau.
S. modesta, Hall, 1857. Lower Helderberg.
S. mortonana, Miller, 1883. Keokuk.
S. mucronata, Conrad, 1841. Marcellus, Hamilton, Chemung.
[*S. pennata*, Atwater, 1820, Mr. S. A. Miller regards as identical with Conrad's *S. mucronata*.]

S. multicosatus, Castelnau, 1843. Probably identical with *S. divaricata* Hall, 1857.

S. multistriata, Hall, 1857 = *Trematospira multistriata*.

S. munchisoni, Castelnau, 1843. Very likely identical with *S. arrecta*, Hall, 1859.

S. mysticensis, Meek, 1873. Lower Carboniferous.

S. neglecta, Hall, 1858. Keokuk.

S. newberryi, Hall, 1883. Waverly.

S. niagarensis, Conrad, 1842. Niagara.

S. niagarensis var. *oligoptycha*, Roemer, 1860. Niagara.

S. nictavensis, Dawson, 1878. Lower Devonian.

S. nobilis, Barrande. Niagara.

S. norwoodi, Meek, 1860. Middle Devonian.

S. norwoodana, Hall, 1858. = *Spiriferina norwoodana*.

S. novamexicana, Miller, 1881. Burlington.

S. nympa, Billings, 1863. Lower Helderberg.

S. octocostata, Hall, 1857. Lower Helderberg.

S. opima, Hall, 1858. Syn. for *S. rockymontana*, Marcou.

S. orestes, Hall and Whitfield, 1872. Chemung.

S. oregonensis, Shumard, 1863. Coal Measures.

S. osagensis, Swallow, 1860. Choteau.

S. ovalis, Phillip's species, 1836. Davidson mentions having received this species of Prof. Worthen from Keokuk, Iowa. He very likely regarded *S. suborbicularis*, Hall, as a synonym. I have never seen specimens of Phillip's species found in America.

S. oweni, Hall, 1857. Hamilton.

S. paradoxa, Schlotheim's species, 1813. Doubtfully identified by Meek and Worthen in the Upper Helderberg of Illinois.

S. parryana, Hall, 1858. Hamilton.

S. peculiaris, Shumard, 1855. Kinderhook.

S. pedroana, Rathbun, 1874. Middle Devonian of South America.

S. pennata, Owen, 1852. Syn. for *S. ligus*, Owen.

S. pennata, Atwater, 1820. Hamilton of Ohio. See *S. mucronata*.

S. pentlandi, D'Orbigny, 1842. Carboniferous of South America.

S. perextensa, Meek and Worthen, 1868. Corniferous.

S. perforata, Hall, 1857. = *Trematospira perforata*.

S. perlamellosa, Hall, 1857. Lower Helderberg.

S. perplexa, McChesney, 1860. Carboniferous.

S. pertenuis, Hall, 1857. Hamilton.

S. peruviana, D'Orbigny, 1842 (*Terebratula peruviana*). Lower Devonian of South America.

S. pharovicina, A. Winchell, 1862. Huron.

- S. pinonensis*, Meek, 1870. Devonian.
 ? *S. planoconvexa*, Shumard, 1855. Coal Measures.
S. plena, Hall, 1858. = ?*Syringothyris plena*.
S. plicatella of American authors (non Sowerby). Syn. for *S. radiata*, Sowerby.
S. pluto, Clarke, 1885. Genesee.
S. præmatura, Hall, 1867. Chemung.
S. propinquus, Hall, 1858 = *Syringothyris texta*, Hall.
S. prora, Conrad, 1842. Syn. for *S. acuminata*, Conrad, 1839.
S. pseudolineata, Hall, 1858. Keokuk.
S. pulchra, Meek, 1860 = *Spiriferina pulchra*.
S. pyramidalis, Hall, 1852 = *Cyrtina pyramidalis*.
S. pyxidata, Hall, 1859. Oriskany.
S. quichua, D'Orbigny, 1842. Lower Devonian of South America.
S. racinensis, McChesney, 1861. Syn. for *S. nobilis*, Barrande.
S. radiata, Sowerby, 1825. Niagara.
S. raricosta, Conrad, 1842. Low. Held., Schoharie grit, Carboniferous.
S. richardsoni, Meek, 1868. Hamilton.
S. rockymontana, Marcou, 1858. Upper Carboniferous.
S. rostellata, Hall, 1858. Keokuk.
S. rostellum, Hall and Whitfield, 1872. Niagara.
S. rostrata, Morton, 1836. Coal Measures. This is very likely an *Athyris*.
S. rugicosta, Hall, 1860. Upper Silurian.
S. rugatina, Conrad, 1842. Syn. for *S. sulcata*, Hisinger.
S. saffordi, Hall, 1859. Lower Helderberg.
S. scobina, Meek, 1860. Carboniferous.
S. sculptilis, Hall, 1843. Hamilton.
S. segmenta, Hall, 1857. Upper Helderberg.
S. semiplicata, Hall, 1860. Syn. for *S. cooperensis*, Swallow, 1860.
S. setigera, Hall, 1858. Chester.
S. sheppardi, Castelnau, 1843 = *Orthis* (*Platystrophia*) *sheppardi*.
S. sillana, A. Winchell, 1865. Waverly.
S. similior, Winchell & Marcy, 1865 = *Pentamerus similior*.
S. solidirostris, White, 1860 = *Spiriferina solidirostris*.
S. sowerbyi, Castelnau, 1843 (non Fischer). Syn. for *S. mucronata*, Conrad.
S. spinosa, Norwood and Pratten, 1855 = *Spiriferina spinosa*.
S. staminea, Hall, 1843. Syn. for *S. crispa*, Hisinger.
S. striatiformis, Meek, 1875. Waverly.
S. striata, Marcou, 1858 (non Martin). Syn. for *S. marcoui*, Waagen.
S. striata, Martin species, 1809. Carboniferous.

- S. strigosa*, Meek, 1860. Devonian.
S. subæqualis, Hall, 1858. Warsaw.
S. subattenuata, Hall, 1858. Hamilton, Chemung, Marshall.
S. subcardiformis, Hall, 1858. Warsaw.
S. subcuspidatus, Hall, 1858 (non Schnur, 1831) = *Syringothyris texta*, Hall.
S. subdecussata, Whiteaves, 1889. Hamilton.
S. subelliptica, McChesney, 1860 = *Spiriferina subelliptica*.
S. sublineata, Meek, 1868. Devonian.
S. submucronata, Hall, 1857. Oriskany.
S. submucronata, Hall, 1858 (non 1857). Syn. for *S. subattenuata*, Hall.
S. suborbicularis, Hall, 1858. Keokuk.
S. subrotundata, Hall, 1858. Kinderhook. This name was used earlier by McCoy, but as it is regarded by the best European authors as a synonym of *S. pinguis*, Sowerby, the name will not interfere with Prof. Hall's species.
S. subsulcata, Hall, 1860. Upper Silurian.
S. subumbona, Hall, 1857. Marcellus, Hamilton, Portage.
S. subundifera, Meek and Worthen, 1868. Hamilton.
S. subvaricosa, Hall and Whitfield, 1872. Hamilton.
S. subventricosa, McChesney, 1860. Syn. for *S. rockymontana*, Marcou.
S. sulcata, Hisinger, 1837. Niagara.
S. sulcifera, Shumard, 1858. Upper Carboniferous.
S. superba, Billings, 1874. Syn. for *S. billingsana*, S. A. Miller.
S. taneyensis, Swallow, 1860. Choteau.
S. temeraria, Miller, 1881. Burlington.
S. tenuicostata, Hall, 1858. Keokuk.
S. tenuimarginata, Hall, 1858. Keokuk.
S. tenuis, Hall, 1857. Hamilton.
S. tenuistriata, Hall, 1859. Lower Helderberg.
S. tenuistriata, Shaler, 1865. Syn. for *S. radiata*, Sowerby.
S. texana, Meek, 1871. Upper Carboniferous.
S. texta, Hall, 1857 = *Syringothyris texta*.
S. translata, Swallow, 1863. Chester.
S. transversa, McChesney, 1860 = *Spiriferina transversa*.
S. tribulis, Hall, 1859. Oriskany.
S. trigonalis, Martin's species, 1809. Identified by Walcott in the lower portion of the Carboniferous of the Eureka district, Nevada.
S. triplicata, Hall, 1852. Syn. for *S. camerata*, Morton.
S. triradialis, Meek, 1873 (non Phillips). Syn. for *S. agelaia*, Meek.

S. troosti, Castelnau, 1843. ? Devonian.

S. tullia, Hall, 1867. Hamilton.

S. undulata, Vanuxem, 1842 (non Sowerby). Syn. for *S. raricosta*, Conrad.

S. undifera, Roemer, 1844. Identified by Walcott in the lower Devonian, Eureka district, Nevada.

S. unica, Hall, 1867. Syn. for *S. arenosa*, Conrad.

S. urbana, Calvin, 1888. Hamilton.

S. utahensis, Meek, 1860. Syn. for *S. norwoodi*, Meek.

S. valenteana, Rathbun, 1874. Middle Devonian of South America.

S. vanuxemi, Hall, 1859. Lower Helderberg.

S. varicosa, Hall, 1857. Upper Helderberg.

S. venusta, Hall, 1860. Syn. for *S. divaricata*, Hall.

S. vernonensis, Swallow, 1860. Choteau.

S. vernonensis var. *ozarkensis*, Swallow, 1860. Choteau.

S. ? waldronensis, Miller and Dyer, 1878 = ? *Triplesia waldronensis*.

S. waverlyensis, A. Winchell, 1870. Waverly.

S. whitneyi, Hall, 1858. Chemung? [*Tschernyschew*, 1887, placed it as a synonym under *S. archiaci*, Murchison.]

S. winchelli, Herrick, 1888. Waverly.

S. wortheni, Hall, 1857. Hamilton.

S. wortheni, Meek, 1877. Oriskany. Meek & Worthen described this species first as *S. engelmanni*, 1868, finding the name preoccupied; Meek in 1877 proposed *S. wortheni*. This name is also preoccupied (Hall, 1857); therefore, I will change it to *S. worthenana* n. sp.

S. ziczac, Hall, 1843 (non *S. zickzack*, Roemer, 1843), Syn. for *S. consobrina*, D'Orbigny.

SPIRIFERINA, D'Orbigny.

S. billingsi, Shumard, 1858. Upper Carboniferous.

S. binacuta, A. Winchell, 1865. Burlington.

S. clarksvillensis, A. Winchell, 1865. Choteau.

S. depressa, Herrick, 1888. Waverly.

S. gonionota, Meek, 1877. Carboniferous.

S. kentuckiensis, Shumard, 1885. Coal Measures. There is great difference of opinion regarding this species. It has been identified with *S. cristata*, Schl.; *S. octoplicata*, Sowerby and *S. laminosa*, McCoy.

S. kentuckiensis var. *propatula*, Swallow, 1866. Upper Carb.

S. norwoodana, Hall, 1858. St. Louis.

S. pulchra, Meek, 1860. Carboniferous.

S. solidirostris, White, 1860. Kinderhook.

S. spinosa, Norwood and Pratten, 1855. Chester.

S. spinosa var. *campestris*, White, 1874. Carboniferous. This has since been regarded as a synonym for *S. octoplicata*, Sowerby.

S. subelliptica, McChesney, 1860. Knobstone.

S. subtexta, White, 1862. Burlington.

S. transversa, McChesney, 1860. Chester.

SYRINGOTHYRIS, Winchell.

S. alta, Hall, 1867. Chemung.

S. angulata, Simpson, 1889. Waverly.

S. carteri, Hall, 1857. Waverly.

S. cuspidata, Martin, 1796. Carboniferous.

S. extenuata, Hall, 1858. Kinderhook.

S. gigas, Troost, 1841. (*Cyrtia gigas*.) Lower Carboniferous.

S. halli, A. Winchell, 1863. Syn. for *S. extenuata*, Hall.

S. randalli, Simpson, 1889. Waverly.

S. texta, Hall, 1857. Waverly and Knobstone.

S. typa, A. Winchell, 1863. Syn. for *S. carteri*, Hall.

Fossil Dictyospongidae of the Devonian and Carboniferous Formations.

NEW FORMS OF DICTYOSPONGIDÆ FROM THE ROCKS OF THE CHEMUNG GROUP.*

By JAMES HALL.

Since the publication of the preliminary discussions of the genera and species of this remarkable group of organisms, much additional material of interest has come into my hands, largely from the rocks of the Chemung group in Alleghany and adjoining counties in the State of New York. This formation has already furnished *fourteen* species of the genus DICTYOPHYTON, besides the curious basket sponge, Uphantænia and probable, though incomplete, evidences of the genera PHRAGMODICTYA and ECTENODICTYA. It is now necessary to add two other genera to this number, viz., ACTINODICTYA and CRYPTODICTYA. The group proposed for discussion in my final work on the reticulate sponges now includes twelve genera and subgenera represented (*at present*) by forty-six species. Of the latter, two are from the Utica slate, one from the Hamilton shales, twenty-four from the Chemung group, seven from the Waverly and twelve from other horizons of the lower carboniferous period.

There are at least two other species remaining undescribed, and by the end of the present season I expect to record at least *fifty* species of this family of sponges.

DICTYOPHYTON SCEPTRUM, sp. n.

Cup circular to elliptical in transverse section; subcylindrical, usually abnormally compressed, rarely curved; tapering toward the base and narrowing more abruptly to the aperture.

Point of attachment not observed.

Surface without nodes or irregularities except those arising from distortion in fossilization; coarsely reticulated by longitudinal and transverse spicular bands. The primary bands form comparatively large rectangular meshes which are subdivided by the crossing of the subordinate bands.

*See first published notice of the following species in the Proceedings of the Geological Society of America.

The specimens at hand show considerable variation in form and dimensions, though the surface characters are persistent throughout. The best preserved and most robust of these, in which the aperture is retained but the basal portion lost, has a length of 206 mm., and a width across the aperture of 56 mm., greatest width, 69 mm. A much more slender example measures 256 mm. in length and 38 mm. in width. The tendency to curvature in growth is carried to an extreme in a single specimen which has the form of an arc with a radius of 65 mm.

Formation and localities.—In the sandstones of the Chemung group at Alfred, Friendship and Nile, Allegany county, N. Y.

DICTYOPHYTON VASCELLUM, sp. n.

The original specimen of this species is a large explanate fragment indicating a broad, flattened cup, one of whose transverse diameters is six times the other. The cup appears to have expanded rapidly from the base upward, and in transverse section was probably elongate-elliptical.

Surface rather finely reticulate, the primary longitudinal and transverse bands being numerous and the meshes made by them, square; only a single series of secondary bands is observable.

In addition to these bands is a series of very broad, obscure reticulating ridges parallel to and crossed by the bands. These are much more distinctly retained on the lower, slightly concave side of the specimen, and appear to have been of purely ornamental character. The normal width of the original is 150 mm.; the length as far as preserved 188 mm.

Formation and locality. A loose, somewhat waterworn fragment from the Chemung group; found at Alfred, Allegany county, N. Y.

DICTYOPHYTON RANDALLI, sp. n.

Cup subcylindrical or gradually expanding. Reticulum composed of cancellating acicular bands of nearly equal size. Surface crossed by series of ridges parallel to the bands; these are of two sizes, the larger making quadrate areas which are subdivided into four quadrules by the lesser series; these again are divided by the meshes of the reticulum into sixteen smaller quadrules and each one of these divided into four parts by the finest of the spicular bands. There are, thus, in each of the squares into which the surface is divided 256 quadrules of the third degree.

At the intersection of the primary and secondary surface ridges, a low node is formed, the size of which depends on the value of the intersecting ridges. The original specimen is entire at the aperture,

which in its compressed condition has a width of 75 mm.; the greatest length of the fragment is 87 mm.

This species presents some similarities to *D. rude* but may be distinguished by the double series of surface ridges and the squares formed by their intersection.

Formation and locality. In the Waverly group at Warren, Penn.

Dictyophyton scitum, sp. n.

The original specimen of this species presents surface features apparently similar to those described for *D. Randalli*. The primary and secondary ridges in the latter species, which appear to be pure ornamental characters, are here spicular bands of greatly different size, and making but slight nodes at their intersection. The quadrate areas are comparatively small and somewhat elongated, each containing four quadrules made by intersection with the secondary bands and each of the latter, four or possibly sixteen meshes of lesser degree.

The original has a length of 120 mm. and a width of 50 mm.

Formation and locality.—In the Chemung sandstones at the Chemung Narrows, N. Y.

Dictyophyton Amalthea, sp. n.

Cup slender, expanding very gradually, probably circular in transverse section, gently curved toward the base. In the original specimen the basal portion is wanting, but the remainder of the surface bears four deep and broad constrictions, which increase in size toward the aperture and give to the cup the appearance of being strongly annulated. The area about and below the aperture is without a constriction at the usual interval. The reticulum is marked by a series of distant longitudinal ridges or spicular bands of which six or seven are visible on the exposed surface, but no other trace of structure is evident.

The description is drawn from a plaster cast of the original specimen which was formerly in the possession of the Rev. A. H. Riley, of Montrose, Penn. This measures from the aperture, which is entire, to a point near the base, where the specimen is broken, 280 mm. in length, 70 mm. in width across the aperture and 20 mm. in width near the base.

Formation and locality.—Chemung group, Great Bend, Penn.

Dictyophyton tomaculum, sp. n.

In the original specimen the *cup* was apparently circular or sub-elliptical in cross section, tapering very slowly toward the base and slightly curved. Base and aperture unknown. Surface covered with

a primary series of low, narrow ridges, intersected by a secondary series. Each of the four quadrules thus formed contains sixteen meshes of the third degree and sixty-four meshes of the fourth degree.

The species may be distinguished from *D. Randalli* which it somewhat resembles in the characters of the reticulum by the more elongate cup, the narrow and fainter ridges of the first and second order and the larger squares made by the intersection.

The length of the original is 135 mm.; width at the basal end 50 mm., at the apertural end, 60 mm.

Formation and locality.—In the Chemung sandstone at Alfred, Allegany county, N. Y.

Dictyophyton? (Phragmodictya) Halli, sp. n.*

Cup usually small, narrowest above the base and rapidly expanding to the aperture. The base sometimes appears to be acute but in many specimens the lower extremity is broad, flattened, slightly concave or convex, as though crossed by a septum. *Reticulum* composed of a primary series of cancellating ridges (spicular bands?) which make elongate rectangular meshes, nodate at the points of intersection; a secondary series of similar ridges is apparent under good preservation; within the quadrules formed by the crossing of these ridges, is a very finely reticulate mesh.

The general exterior character of the reticulum in this species is very similar to that in *D. rude*.

The species is, however, well characterized by its small size and slender habit of growth, as exemplified in fifty individuals from the same locality, and by the peculiar nature of its basal extremity.

The dimensions of an average specimen are, length, 85 mm. width across the aperture, 50 mm.; width across the base, 25 mm.; least width, 18 mm.

Formation and locality.—In the shales of the Chemung group at Wellsville, Allegany county, N. Y.

Actinodictya, gen. nov.

Amorphous or explanate, surface generally slightly convex, spreading, uninclosed forms, irregularly reticulated by strong bands of circular spicules.

The stronger bands are oblique to the general direction of the frond, with shorter radiating bands, giving the intermediate spaces a stellate character. An extremely fine rectangular reticulation covering the entire surface.

* Discovered by Mr. E. B. Hall of Wellsville, to whom I am indebted for the specimens described and in whose honor the name is given.

ACTINODICTYA PLACENTA, sp. n.

Reticulum usually longer in one diameter than in the other. Surface generally somewhat elongate and convex, rarely flat; margins usually without definition. The spicular bands cross the surface in all directions, making polygonal meshes of various sizes. Bands of different sizes are apparent, but they can not be satisfactorily divided into primary and secondary series. Its surface is usually free of any pronounced irregularities. This curious form appears to have grown in broad, flabellate expansions over the sea-bottom, perhaps conforming to the contour of other objects.

As generally found, they have accumulated one above the other in layers parallel with the plane of sedimentation. The largest fragment observed has a length of 250 mm. and a greatest width of 85 mm.

Formation and localities.—In the Chemung group, at Howard and Cohocton, Steuben county, N. Y., and on a creek two miles above Lawrenceville, Tioga county, Penn.

CRYPTODICTYA, gen. nov.

Irregularly growing, uninclosed (?) nodose or vesiculose forms composed of a thick obscurely reticulate or non-reticulate plasma with very obscure spicules.

CRYPTODICTYA ALLENI, sp. n.

Reticulum irregularly explanate, more or less convex generally longer in one diameter. Where the margin is distinctly preserved it appears to be usually incurved or abruptly deflected from the general surface of expansion. The edges of this surface are usually bordered by a series of prominent nodes, which are frequently the most conspicuous occurring on the fossil. These nodes are large or small, frequently compound, scattered at irregular intervals over the surface, sometimes approximating a regularity which gives to the species a form suggestive of *Dictyophyton tuberosum*. The spicular bands are very obscure but are sometimes distinctly seen near the margins as fine subparallel lines.

The great variety of form presented by this fossil indicates that, with more complete material it may be possible to establish differences of specific value, but the specimens at hand, though of considerable number, do not justify such a separation at present.

The largest example has a length of 225 mm. and a greatest width of 130 mm. Essentially these proportions are retained in all nearly entire individuals.

Formation and localities.—In the Chemung sandstones at Cohocton, Steuben county and Lyndon, Cattaraugus county, N. Y. Originally discovered and collected by Rev. J. Allen of Alfred University, Alfred, New York.

RECORD OF LOCALITY NUMBERS.

[Continued from the Report of the State Geologist for 1888.]

Nos. 1,000 to 1,100. Primordial rocks and fossils.

Nos. 1,100 to 1,250. Lower Silurian rocks and fossils.

Nos. 1,250 to 1,400. Upper Silurian rocks and fossils.

Nos. 1,400 to 1,550. Devonian from base to Hamilton group.

Nos. 1,550 to 1,750. Hamilton group.

Nos. 1,750 to 1,950. Chemung group.

Nos. 1,950 to 2,000. Catskill group, etc.

No. 1,000. Laurentian gneiss. Little Falls, N. Y. C. Van Deloo, collector. 1882.

No. 1,080. Primordial (breccia). From top of hill, back of Troy, N. Y. J. C. Smock and C. E. Beecher, collectors. 1885.

No. 1,092. Laurentian gneiss. Lone Rock Point and Shelburne Point, near Burlington, Vt., J. W. Hall, collector. 1879.

No. 1,093. Laurentian gneiss. Split Rock Point (Old Iron Mine), Lake Champlain, N. Y. ? J. W. Hall, collector. 1879.

No. 1,094. Trenton limestone. North point of Button bay, north of Button island, opposite Westport, N. Y. J. W. Hall, collector. 1879.

No. 1,095. Potsdam sandstone, Potsdam, N. Y.

No. 1102. Cambrian. Swanton Falls. Strata exposed at foot of falls on left side of river. C. Rominger, collector. 1888.

No. 1103. Chazy limestone. From a boulder, Sharon Springs, N. Y. J. W. Hall, collector. 1880.

No. 1104. Black River group. Lake Champlain, N. Y. ? J. W. Hall, collector. 1879.

No. 1105. Calciferous (?). Lake side of Shelburne Point, two and one-half miles north of Juniper Light, Lake Champlain, N. Y. ? J. W. Hall, collector. 1879.

No. 1106. Calciferous sandstone. Quarry three miles west of Saratoga Springs, near large lime-kiln and stromatopora beds. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1107. Apple Tree Point, north of Burlington, Vt. J. W. Hall, collector. 1879.

No. 1108. Lake Shore, Essex, N. Y.? J. W. Hall, collector. 1879.

No. 1109. Black River group. Button Island, Lake Champlain, Vt., opposite Essex, N. Y.? J. W. Hall, collector. 1879.

No. 1110. Trenton group? Bay, south of Wings Point, Vt., opposite Essex, N. Y. J. W. Hall, collector. 1879.

No. 1111. Chazy? Point and bay east side of Fort Cassin, east side of Lake Champlain. J. W. Hall, collector. 1879.

No. 1112*a*. Calciferous.

No. 1112. Trenton and Chazy. Basin Harbor, east side of Lake Champlain. J. W. Hall, collector. 1879.

No. 1131. Calciferous sandrock. Three miles west of Saratoga, Saratoga county, N. Y. From along line of outcrop of three miles. C. D. Walcott, collector. 1878.

No. 1133. Calciferous. Two to four miles west of Pattersonville, N. Y., on the West Shore railroad, near the Erie canal. C. Van Deloo, collector. 1882.

No. 1134. Calciferous. Little Falls, N. Y. C. Van Deloo, collector. 1882.

No. 1135. Birdseye limestone. Two and three-quarter miles west of Saratoga Springs, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1136. Birdseye limestone. Fort Cassin, Vt. C. Rominger, collector. 1888.

No. 1137. Birdseye limestone. Fort Cassin, Vt. Lowest strata. C. Rominger, collector. 1888.

No. 1138. Birdseye limestone. Four miles south of Rouse's Point, on Mr. King's farm. C. Rominger, collector. 1888.

No. 1139. Trenton limestone. Three miles west of Saratoga village. Quarries of Prince Wing. C. D. Walcott and C. Van Deloo, collectors, 1877.

No. 1140. Trenton limestone. Leyden, Lewis county, N. Y. Sugar river below the falls. From H. T. Hickok, collector, 1872.

No. 1141. Trenton limestone. Whetstone creek, Martinsburg, Lewis county, N. Y. From H. T. Hickok, 1872.

No. 1142. Trenton limestone. Moose creek, Leyden, Lewis county, N. Y. From H. T. Hickok, collector, 1872.

No. 1143. Trenton limestone. Hubbard's creek, Leyden, Lewis county, N. Y. H. T. Hickok, collector, 1872.

No. 1144. Trenton limestone. Sprakers Basin, N. Y.

No. 1145. Trenton limestone.

No. 1146. Trenton limestone. Carlton Island, N. Y. Clarke collection, purchased 1889.

No. 1147. Trenton limestone. Highgate Springs, Vt., west of hotel, lowest strata near Lake Shore. C. Rominger, collector, 1888.

No. 1148. Trenton limestone? Highgate Springs, Vt., east of hotel. C. Rominger, collector, 1888.

No. 1149. Birdseye (?) limestone. Isle la Motte. C. Rominger, collector, 1888.

No. 1150. Trenton limestone. Chazy, N. Y. C. Rominger, collector, 1888.

No. 1151. Trenton limestone. Boulder on shore at Isle la Motte. C. Rominger, collector, 1888.

No. 1152. Black River and Birdseye limestone. Chazy quarries, Chazy, N. Y. C. Rominger, collector. 1888.

No. 1153. Trenton limestone. At Lighthouse Point, near Port Henry. C. Rominger, collector. 1888.

No. 1154. Trenton limestone. Rawlins Mills, four miles southwest Saratoga, N. Y. C. Rominger, collector. 1888.

No. 1155. Limestone overlying Potsdam sandstone. Skeen mountain, Whitehall, N. Y. C. Rominger, collector. 1888.

No. 1156. Limestone on railroad from Whitehall to Rutland, N. Y., beneath second slate belt. C. Rominger, collector. 1888.

No. 1157. Limestone and underlying slates. Smith's Basin. C. Rominger, collector. 1888.

No. 1158. Lower strata at Port Henry, N. Y., with *Maclurea*. C. Rominger, collector. 1888.

No. 1159. C. Rominger, collector. 1888.

No. 1160. C. Rominger, collector. 1888.

No. 1234. Hudson River shales exposed near the bridge at Swanton village, Vt. C. Rominger, collector. 1888.

No. 1235. Hudson River group. Dubuque county, Iowa, by exchange, February, 1887, from J. F. Abbott, Manchester, Iowa.

No. 1236. Hudson River slates (*Graptolites*). Two miles below West Park, Ulster county, N. Y., along West Shore railroad. James Hall, collector. 1886.

No. 1237. Hudson River slates (*Graptolites*). Van Wie's Point, below Albany, N. Y., from cutting of West Shore railroad. C. Van Deloo, collector. 1883.

No. 1238. Hudson River slates (*Graptolites*). Kenwood, Albany county, N. Y. R. P. Whitfield, C. Van Deloo and others, collectors. 1874?

No. 1239. Utica Slate. Cold Spring, seven miles east of Little Falls, N. Y. C. Van Deloo, collector. 1880.

No. 1240. Hudson River group. Drift rock in Genesee and Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1241. Hudson River group. Lake Champlain, Button Island. J. W. Hall, collector. 1879.

No. 1242. Utica slate. Tivoli lake, Albany, N. Y. J. W. Hall and C. E. Beecher, collectors. 1879.

No. 1243. Utica slate? Tivoli lake, Albany, N. Y. C. Van Deloo and C. E. Beecher, collectors. 1880.

No. 1244. Utica slate. Martinsburgh, Lewis county (Whetstone Gulf), N. Y. From H. T. Hickok. 1872.

No. 1245. Utica slate. Leyden, Lewis county, N. Y. Sugar river above the falls. H. T. Hickok, collector.

No. 1246. Utica slate. Holland Patent, Oneida county, N. Y. In exchange and purchase of Charles Haskell. 1881.

No. 1247. Utica slate. Sprakers Basin, N. Y.

No. 1248. Utica slate. Holland Patent, Oneida county, N. Y. Donated by Rev. W. H. Dean, Mechanicville, N. Y. 1881.

No. 1249. Utica slate. Holland Patent, Oneida county, N. Y. Purchased of Charles Haskell. 1881.

No. 1250. Utica slate. One to three miles beyond "Two Mile House" near Schenectady, N. Y., on West Shore railroad. C. Van Deloo, collector. 1882.

No. 1251. Hudson River shales. East shore Saratoga lake. C. D. Walcott and C. Van Deloo, collectors.

No. 1252. Hudson River slates. Chimney Point Gulf, Martinsburgh, Lewis county, N. Y. H. T. Hickok. 1872.

No. 1253. Clinton Group. (Blue shales and Iron Ore). Clinton near Utica, N. Y. G. B. Simpson, collector. 1873.

No. 1254. Niagara group. Hamilton, Ontario, C. W. C. D. Walcott, collector.

No. 1255. Medina sandstone. Hamilton, Ontario, C. W. C. D. Walcott, collector.

No. 1256. Clinton group. Hamilton, Ontario, C. W. C. D. Walcott, collector. 1878.

No. 1257. Niagara group. Hamilton, Ontario, C. W. Donated by Wm. Waddell, Hamilton, Ontario. 1878.

No. 1258. Clinton group. Hamilton, Ontario, C. W. Donated by Wm. Waddell, Hamilton, Ont.

No. 1259. Medina sandstone. Hamilton, Ontario, C. W. Donated by Wm. Waddell, Hamilton, Ont.

No. 1260. Niagara group. Delaware county, Iowa. By exchange from J. T. Abbott, Manchester, Iowa. 1887.

No. 1261. Niagara group. Delphi, Indiana. James Hall, collector. 1888.

No. 1262. Niagara group and Hamilton group of the Falls of the Ohio. Purchased of G. K. Greene. 1888.

No. 1263. Lower Helderberg group. Tentaculite limestone, east of Clarksville.

No. 1265. Lower Helderberg group. Clarksville, Albany county, and vicinity. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1266. Lower Helderberg group. Between Carlisle and Sharon. J. W. Hall, collector. 1877.

No. 1267. Lower Helderberg group. Schoharie, N. Y. In exchange for duplicate collection No. 20. Rec'd August, 1881.

No. 1268. Lower Helderberg group. Schoharie, N. Y. James Hall, collector. 1886.

No. 1364. Lower Helderberg group. Catskill, N. Y. G. B. Simpson, collector. 1877.

No. 1365. Lower Helderberg group. Clarksville, N. Y., and vicinity. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1366. Lower Helderberg group. Clarksville, N. Y., and vicinity. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1367. Lower Helderberg group. From drift, Thompson's lake, N. Y. C. Van Deloo, collector. 1877.

No. 1368. Lower Helderberg group. Jerusalem Hill, Herkimer county, N. Y. G. B. Simpson, collector. 1873.

No. 1369. Lower Helderberg group (Waterlime). Jerusalem Hill, Herkimer county, N. Y. G. B. Simpson, collector. 1873.

No. 1370. Lower Helderberg group. In the vicinity of Bradford Allen's and Case Slingerland's, near Clarksville, Albany county, N. Y. Clarke collection, purchased. 1889.

No. 1371. Lower Helderberg group. Becroft's mountain, near Hudson, N. Y. Clarke collection, purchased 1889.

No. 1372. Lower Helderberg group. Schoharie, N. Y. Clarke collection, purchased. 1889.

No. 1373. Lower Helderberg group. Square lake, Maine. Clarke collection, purchased. 1889.

No. 1390. Oriskany sandstone. Cayuga, Ontario, C. W. C. D. Walcott, collector. 1878.

No. 1391. Oriskany sandstone. South Walpole, Ontario, C. W. C. D. Walcott, collector. 1878.

No. 1392. Oriskany sandstone. In drift at Thompson's lake. Albany county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1393. Oriskany sandstone. Schoharie, N. Y. From the Schoharie public school. 1881.

No. 1394. Oriskany sandstone. Knox, Albany county, N. Y. C. Van Deloo, collector. 1882.

No. 1412. Schoharie grit. Near Clarksville, Albany county, N. Y. Clarke collection purchased. 1889.

No. 1413. Schoharie grit. Schoharie, N. Y.

No. 1413a. Cauda galli grit. Schoharie, N. Y.

No. 1414. Schoharie grit. From drift in the vicinity of Thompson's lake, Albany county, N. Y. C. D. Walcott and C. Van Deloo, collector.

No. 1415. Schoharie grit. Clarksville, Albany county, N. Y. J. W. Hall, collector. 1878.

No. 1442. Onondaga limestone. LeRoy, Genesee county, N. Y. C. D. Walcott, collector. 1878.

No. 1450. Corniferous limestone. Caledonia, Livingston county, N. Y. Two and one-half miles northeast of village on farm of Mr. Frick. C. D. Walcott and C. Van Deloo, collector. 1877.

No. 1451. Corniferous limestone. Caledonia, west and northwest of village. C. D. Walcott and C. Van Deloo, collector. 1877.

No. 1452. Corniferous limestone. LeRoy, Genesee county, N. Y. Two and one-half to three miles east northeast of village. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1453. Corniferous limestone. Falkirk, Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1454. Corniferous limestone. Clarence Hollow, Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1455. Corniferous limestone. Two and one-half to three miles west northwest of LeRoy, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1456. Corniferous limestone. Williamsville, Erie county, N. Y. C. D. Walcott, collector. 1878.

No. 1457. Upper Helderberg group. Thompson's lake, Albany county, N. Y. C. D. Walcott and C. Van Deloo, collectors.

No. 1458. Corniferous limestone. Littleville, near Avon, N. Y. C. Van Deloo, collector. 1878.

No. 1459. Corniferous limestone. Indian Falls, Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1460. Corniferous limestone. Rama's farm, Pt. Colborne, Ontario, C. W. C. D. Walcott, collector. 1878.

No. 1461. Corniferous limestone. Cayuga, Ontario, C. W. C. D. Walcott, collector. 1878.

No. 1462. Upper Helderberg group. Falkirk, Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

- No. 1463. Corniferous limestone. Walpole, Ontario, C. W. C. D. Walcott, collector. 1878.
- No. 1464. Corniferous limestone. One mile below Peoria, cliff below school-house. J. W. Hall, collector. 1877.
- No. 1465. Corniferous limestone. Mumford, Livingston county, N. Y. C. D. Walcott, collector. 1878.
- No. 1466. Corniferous limestone. Clarksville, Albany county, N. Y. J. W. Hall, collector. 1877.
- No. 1467. Corniferous limestone. Coeymans Hollow, N. Y. J. W. Hall, collector. 1877.
- No. 1468. Corniferous limestone. In the neighborhood of Batavia, Genesee county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.
- No. 1469. Corniferous limestone. Kelley's Island, Ohio. C. D. Walcott, collector. 1878.
- No. 1470. Corniferous limestone. Schoharie, N. Y. From the Schoharie public school. 1881.
- No. 1471. Corniferous limestone. Thompson's lake, Albany county, N. Y. J. W. Hall, collector. 1877.
- No. 1472. Corniferous limestone. Eastman's and Greenslit quarries, Waterville, Oneida county, N. Y. J. M. Clarke, collector. 1886.
- No. 1473. Corniferous limestone. Manlius, Onondaga county, N. Y. J. M. Clarke, collector. 1886.
- No. 1474. Corniferous limestone. Decomposed chert boulders from towns of Canandaigua, East Bloomfield and Farmington, Ontario county, N. Y. J. M. Clarke, collector. 1886.
- No. 1475. Corniferous limestone. On Flint creek, at Phelps Junction, Ontario county, N. Y. J. M. Clarke, collector. 1886.
- No. 1476. Corniferous limestone. N. Y. C. R. R., one and one-half miles west of Clifton Springs, Ontario county, N. Y. J. M. Clarke, collector. 1886.
- No. 1477. Corniferous limestone. Howell's and Holmes' quarries, Lime Rock, three miles northeast of LeRoy, N. Y. J. M. Clarke, collector. 1886.
- No. 1478. Onondaga limestone. Clarence, Erie county, N. Y. J. M. Clarke, collector. 1886.
- No. 1479. Corniferous limestone. Stafford, Genesee county, N. Y. J. M. Clarke, collector. 1886.
- No. 1480. Corniferous limestone. Howell's and Holmes' quarries, Lime Rock, three miles northeast of LeRoy, N. Y. J. M. Clarke and J. Van Deloo, collectors. 1888.
- No. 1481. Corniferous limestone. From boulders of decomposed chert in the drift in the towns of Canandaigua, East and West Bloom-

field and Phelps, Ontario county, N. Y. Clarke collection purchased. 1889.

No. 1482.

No. 1483. Corniferous limestone. Near Marbletown, Ulster county, N. Y. Clarke collection purchased. 1889.

No. 1548. Corniferous limestone. Clarke county, Ind. Purchased of G. K. Greene. 1888.

No. 1549. Corniferous limestone. Clarke county, Ind. Purchased of G. K. Greene. 1888.

No. 1550.

No. 1551.

No. 1552. Marcellus shale. Littleville, near Avon, N. Y. C. Van Deloo, collector. 1878.

No. 1553. Marcellus shale. One and one-half miles east of Alden, N. Y., on the Erie R. R. track. C. Van Deloo, collector. 1878.

No. 1554. Marcellus shale. LeRoy, N. Y. C. D. Walcott, collector. 1878.

No. 1555. Marcellus shale. Limestone layer, ten feet above Corniferous Limestone. Heal's farm, Stafford, Genesee county, N. Y. J. M. Clarke, collector. 1886.

No. 1556. Marcellus limestone layer, ten feet above Corniferous Limestone. Heal's farm, Stafford, Genesee county, N. Y. J. M. Clarke and J. Van Deloo, collectors. 1888.

No. 1557. Marcellus shale. Base of formation. Flint creek, township of Phelps, Ontario county, N. Y. Clarke's collection, purchased. 1889.

No. 1558. Marcellus shale. Mud creek, East Bloomfield, N. Y. Clarke collection, purchased. 1889.

No. 1559.

No. 1560. Hamilton group. Hill's gulch, Pavilion, Genesee county, N. Y. C. D. Walcott, collector.

No. 1561. Hamilton group. Near York, Livingston, county, N. Y. C. Van Deloo, collector. 1878.

No. 1562. Hamilton group. Jaycox run, between Genesee and Avon, N. Y. C. Van Deloo, collector. 1878.

No. 1563. Hamilton shales. Pratts Falls, Onondaga county, N. Y. J. M. Clarke, collector. 1886.

No. 1564. Hamilton shales. Forty feet below Genesee shales, Tichenor's Gully, Canandaigua lake, N. Y. J. M. Clarke, collector. 1886.

No. 1565. Hamilton shales. Forty feet below Genesee shales, and limestone layer fifty feet above Encrinal limestone, Tichenor's Gully,

Canandaigua Lake, N. Y. J. M. Clarke and J. Van Deloo, collectors. 1888.

No. 1566. Hamilton shales. Fall brook, four miles east of Canandaigua lake on the old Geneva road. C. Van Deloo and Martin Sheehy, collectors. 1886.

No. 1567. Hamilton shales and limestone. One mile north of Centrefield, Ontario county, N. Y., on Seaver's creek. J. M. Clarke and J. Van Deloo, collectors. 1888.

No. 1571. Hamilton group. Phelps quarries, Stony Post and Alpena, Michigan.

No. 1571a. Hamilton group. Thunder Bay river, Michigan.

No. 1571b. Hamilton group. Partridge Point, Michigan.

No. 1571c. Hamilton group. Petosky, Michigan.

No. 1571d. Hamilton group. Long lake, Michigan.

No. 1571e. Hamilton group. Lime quarries at Petosky, Michigan. C. Rominger, collector. 1888.

No. 1572. Hamilton shales. Various localities in the upper part of the group on Canandaigua lake, N. Y. Clarke collection, purchased. 1889.

No. 1573. Hamilton shales. Tichenor's gully, Canandaigua lake, N. Y. Clarke collection, purchased. 1889.

No. 1574. Hamilton shales and limestones. Basal layers at Seaver's creek, near Centrefield, township of Canandaigua, N. Y. Clarke collection, purchased. 1889.

No. 1575. Hamilton shales. Fall brook, Hopewell, Ontario county, N. Y. Clarke collection, purchased. 1889.

No. 1576. Hamilton shales. Thunder Bay, Michigan. Clarke collection, purchased. 1889.

No. 1601. Hamilton group. Two miles south of Darien Centre, on the road to Alden, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1602. Hamilton group. From cutting of Erie railroad track two miles east of Alden, Erie county, N. Y. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1603. Hamilton group. Con. Hill's gulch, four miles south of LeRoy, Genesee county, N. Y. C. D. Walcott, collector. 1878.

No. 1604. Hamilton group. Road from Cooperstown to Hartwick, N. Y. J. W. Hall, collector. 1877.

No. 1605. Hamilton group. Top layers of a blue-stone quarry near Clarksville, Albany county, N. Y. Road between Mud Hollow and Reidsville. J. W. Hall, collector. 1878.

No. 1606. From the Chemung at a quarry near Waverly, Tioga county, N. Y. A. Sherwood, collector.

No. 1607. Hamilton group. Jefferson, Schoharie county, N. Y. A. Sherwood, collector, 1873.

No. 1608. Hamilton group. Franklin, Delaware county, N. Y. From a boulder. A. Sherwood, collector. 1873.

No. 1609. Hamilton group. Near Schoharie, N. Y. From the Schoharie public school. 1881.

No. 1610. Hamilton group. Morrisville, N. Y. J. W. Hall, collector. 1883.

No. 1611. Hamilton group. Earlville, N. Y. J. W. Hall, collector. 1883.

No. 1612. Hamilton group. Eaton, N. Y. J. W. Hall, collector, 1883.

No. 1700. Genesee slate. Two and three-quarter miles south southwest of Alden, Erie county, N. Y. Iron Bridge mill. C. D. Walcott and C. Van Deloo, collectors. 1878.

No. 1701. Genesee slate. Bristol, Ontario county, N. Y. Blacksmith's gully. J. M. Clarke and J. Van Deloo, collectors. 1888.

No. 1702. Genesee shales. Canandaigua lake, N. Y. Clarke collection, purchased. 1889.

No. 1703. Genesee shales. Styliola layer, Bell's gully, Canandaigua lake, N. Y. Clarke collection, purchased. 1889.

No. 1735. Naples shales. Naples, Ontario county, N. Y. Clarke collection purchased. 1889.

No. 1736. Naples shales. Coshaqua creek, Livingston county, N. Y. Clarke collection purchased. 1889.

No. 1750. Oneonta sandstone. Day's quarry, three-quarters of a mile east of Otego, N. Y. J. W. Hall and G. B. Simpson, collectors. 1870.

No. 1751. Oneonta sandstone. (Cypricardites). Five miles from Jefferson on the road to Gilboa, Schoharie county, N. Y. A. Sherwood, collector. 1873.

No. 1752. Chemung group. Mansfield, Tioga county, Penn. A. Sherwood, collector. 1873.

No. 1753. Upper Chemung. Iron ore bed. Austinsville, Bradford county, N. Y. A. Sherwood, collector. 1873.

No. 1754. Chemung group. Franklin, Delaware county, N. Y. A. Sherwood, collector, N. Y. 1873.

No. 1755. Chemung group. Mansfield, Tioga county, Penn. A. Sherwood, collector. 1873.

No. 1756. Chemung group. Charleston township, Tioga county, Penn. A. Sherwood, collector. 1873.

- No. 1757. Chemung group. Tioga, Tioga county, Penn.
- No. 1758. Chemung group. (Cypricardites). Richmond's quarry, Chemung county, N. Y. G. B. Simpson, collector. 1868.
- No. 1759. Chemung group. Cortland, N. Y., and specimens representing a section at Hait's gorge north of Cortland, N. Y. C. E. Beecher, collector. 1883.
- No. 1760. Chemung group. Warren, Penn. C. E. Beecher, collector. 1884.
- No. 1761. Chemung group. Alleghany Springs, Warren county, Penn. C. E. Beecher, collector. 1884.
- No. 1762. Chemung group. Jenk's quarry, Bath, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1763. Chemung group. Sodier's Home, Bath, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1764. Chemung group. Mountain side, west of Bath, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1765. Chemung group. Quarry at Avoca, Steuben county, N. Y. J. W. Hall, collector. 1886.
- No. 1766. Chemung group. Castle Rock near Wallace, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1767. Chemung group. School-house, four miles west of Wallace, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1768. Chemung group. Elmira, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1769. Chemung group. Potter Hill School-house, Wayland, Steuben county, N. Y. J. W. Hall, C. Van Deloo, Martin Sheehy and J. Van Deloo, collectors. 1886.
- No. 1770. Chemung group. Canadice, near church. Clarke collection, purchased. 1889.
- No. 1771. Chemung group. Dansville, N. Y., quarries, on top of hill east of village. Clarke collection, purchased. 1889.
- No. 1772. Chemung group. Haskinsville, Steuben county, N. Y. Clarke collection, purchased. 1889.
- No. 1773. Chemung group. Warren, Penn. Clarke collection, purchased. 1889.
- No. 1875. Chemung group.

No. 1949. Catskill group. Seeley creek, one mile west of Lambs creek, Tioga county, Penn. A. Sherwood, collector. 1873.

No. 1950. Catskill group. Seeley Creek, one mile east of Lambs creek, four miles northwest of Mansfield, Tioga county, Penn. A. Sherwood, collector. 1873.

No. 1960. Waverly group. Warren, Penn. C. E. Beecher, collector. 1884.

No. 1970. Lower Carboniferous. Spergen Hill, Indiana. C. D. Walcott and C. Van Deloo, collectors. 1877.

No. 1972. St. Louis group. Louisville, Indiana. Purchased of G. K. Greene. 1888.

No. 2000. Barren Coal Measures. Carrolton, Ohio. Clarke collection, purchased. 1889.

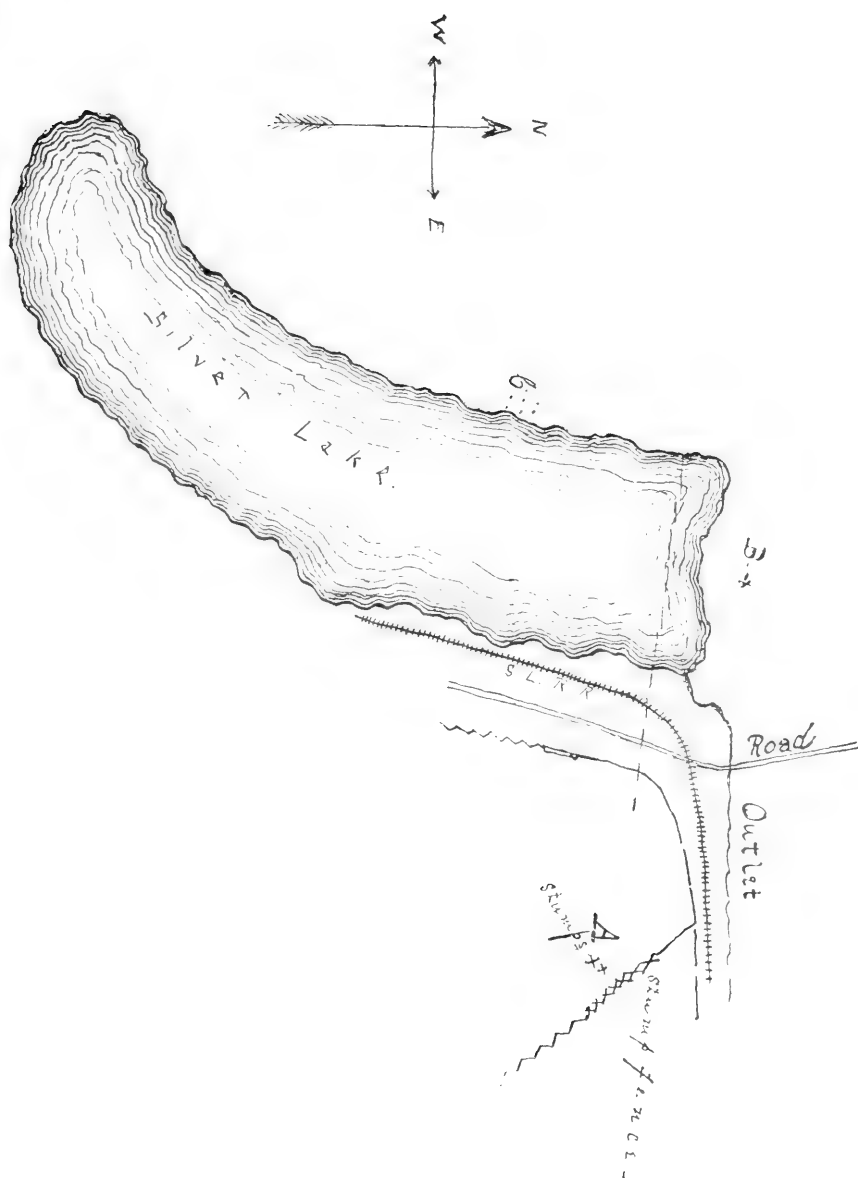


Diagram illustrating the position of the flint implements discovered near the outlet of Silver lake, in Wyoming county, N. Y., by Prof. IRVING P. BISHOP, published in the Report of the State Geologist for the year 1888; pp. 438-440.

REPORT
OF THE
STATE GEOLOGIST,
FOR THE YEAR 1887.



REPORT OF THE STATE GEOLOGIST.

To the Honorable the Board of Regents of the University of the State of New York:

GENTLEMEN.—For several years past, the duties of the State Geologist have been almost entirely restricted to the preparation and publication of the volumes upon the Palæontology of the State, provided for by the law of 1883. This work, which has been for many years conducted in the private buildings of the State Geologist, was interrupted in the spring of 1886 by the necessity for the removal of the accumulated collections of more than thirty years, to a public building. These collections have now been transferred to the State Hall, and the writer was able to occupy the offices prepared for this work only in the latter part of January of the present year, and some weeks longer were required to put ourselves in working order to go on with the printing of the volumes.

I have already reported the completion of the second volume on the Lamellibranchiata in my communication of last year.

The printing of volume VI on the Corals and Bryozoa was begun in August 1886, but it became necessary to suspend this part of the work in order to remove the material and collections in use, to the State Hall, causing a delay of several months.

This volume (VI) consisting of 298+xxvi pages, with sixty-seven plates was completed and published in the early part of September of this year.

Owing however, to the restriction in number of pages of text and of plates of illustration, much material, which had been partially or entirely prepared for publication was necessarily omitted from the volume. I have appended a memorandum of the nature and amount of this material, and would earnestly recommend that some steps be taken to secure its proper publication as an appendix or supplement to the volume already issued. It will be far easier to complete this work at the present time than at any future

period, and if once allowed to drop out of the line of work in progress it will be extremely difficult to revise it, and it can never again be continued under so favorable conditions as the present, when everything is forwarded and the subject fully occupying the minds of those engaged in the work. The number of species described in volume VI is 385, and the number of genera 72.

The following synoptical table presents the names of genera and species therein contain, and will also serve to show their geological relations.

Both for want of space and time, the author has made no attempt to present a classification of the compact, massive or branching forms of the so-termed Bryozoa. Such a work can only be satisfactorily presented after much more careful study of the interior structure, the mode of growth, and the conditions supervening from origin to maturity. Such a classification however is very important, and until that be done the descriptive portion of the work can only be regarded as a step in the progress of research, which may serve a useful purpose — the final presentation of our results.

SYNOPTICAL TABLE OF THE GENERA AND SPECIES DESCRIBED IN VOLUME VI OF THE PALEONTOLOGY OF NEW YORK.
PREPARED BY MR. CHARLES E. BEECHER.

Serial number.	Species number.	NAME AND AUTHOR.	Lower Helderberg.	Schoharie grit.	Corniferous.	Hamilton.	Page.	Plates and Figures.
1	1	<i>Streptelasma</i> , Hall, 1847.	*	.	.	.	1	i. figs. 1-10.
2	1	<i>S. strictum</i> , Hall.....	*	.	.	.	2	i. figs. 11-21.
3	1	<i>Zaphrentis</i> , Rafinesque, 1820.	.	.	.	.	3	ii. figs. 1-6.
4	2	<i>Z. Roemer</i> , Edwards and Halme .....	.	.	.	.	3	ii. figs. 7-8.
5	3	<i>Aulopora</i> , Goldfuss, 1826.	.	.	.	.	4	ii. figs. 9-13, 15-18.
6	3	<i>A. Schoharie</i> , Hall.....	.	.	.	.	5	ii. figs. 14, 19, 20.
7	4	<i>A. tubula</i> , Hall.....	.	.	.	.	5	ii. figs. 24-31.
8	2	<i>A. subtennis</i> , Hall.....	.	.	.	.	6	ii. figs. 32, 33.
9	3	<i>A. elongata</i> , Hall.....	.	.	.	.	6	ii. fig. 23.
10	1	<i>Vermipora</i> , Hall, 1874.	*	.	.	.	6	iii. figs. 14, 15.
11	1	<i>V. serpuloides</i> , Hall.....	*	.	.	.	7	iii. figs. 1, 2, 3, 5.
12	2	<i>V. robusta</i> , Hall.....	*	.	.	.	8	iv. figs. 1, 2; v. figs. 1-3; vi. figs. 1-8.
13	3	<i>V. ? tortuosa</i> , Hall.....	*	.	.	.	9	iii. figs. 4, 6-13.
14	4	<i>S. Issa</i> , Hall.....	*	.	.	.	9	vii. figs. 1-12; viii. fig. 8.
15	5	<i>Striatopora</i> , Hall, 1852.	*	.	.	.	10	vii. figs. 13-15.
16	1	<i>Michelinia</i> , De Koninck, 1842.	*	.	.	.	11	xiii. figs. 15, 16.
17	1	<i>M. lenticularis</i> , Hall.....	*	.	.	.	11	viii. figs. 1-4.
18	1	<i>Favosites</i> , Lamark, 1812.	*	.	.	.	12	viii. figs. 5-7.
19	2	<i>F. Helderbergi</i> , Hall.....	*	.	.	.	8	iv. figs. 1, 2; v. figs. 1-3; vi. figs. 1-8.
20	3	<i>F. conicus</i> , Hall.....	*	.	.	.	9	iii. figs. 4, 6-13.
21	4	<i>F. sphericus</i> , Hall.....	*	.	.	.	9	vii. figs. 1-12; viii. fig. 8.
22	4	<i>F. proximus</i> , Hall.....	*	.	.	.	10	vii. figs. 13-15.
23	1	<i>Alveolites</i> , Lamarck, 1801.	*	.	.	.	11	xiii. figs. 15, 16.
24	1	<i>A. explanatus</i> , Hall.....	*	.	.	.	11	viii. figs. 1-4.
25	1	<i>Chonetes</i> , Fischer, 1837.	*	.	.	.	12	viii. figs. 5-7.
26	1	<i>C. colliculatus</i> , Hall.....	*	.	.	.	11	viii. figs. 1-4.
27	2	<i>C. monticulatus</i> , Hall.....	*	.	.	.	12	viii. figs. 5-7.

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Serial number.	Species number.	NAME AND AUTHOR.	Lower Helderberg.	Schoharie grt.	Corniferous.	Hamilton.	Page.	Plates and Figures.
19	10	Monotrypa, Nicholson, 1879.					67	xvi. fig. 25.
		M. ? spinulosa, Hall.....	*	.	.	.		
20	11	Monotrypella, Ulrich, 1882.					12	ix. figs. 1-3, 6-8 (4, 5)?
21	2	Chaetetes (M.) arbusculus, Hall.....	*	.	.	.	13	ix. figs. 9-11.
22	3	C. (M.) abruptus, Hall.....	*	.	.	.	14	x. figs. 11-13.
23	12	Ptychonema, s. g., Hall, 1887.					14	ix. figs. 12-15.
24	2	Chaetetes (T.) tabulatus, Hall.....	*	.	.	.	15	ix. figs. 16, 17.
		C. (T.) Helderbergie, Hall.....	*	.	.	.	xiv	
25	14	Trematopora, Hall, 1852.					15	x. figs. 1-10; xiii. fig. 4; xxiii. fig. 20.
26	1	Trematella, s. g., Hall, 1886.					69	xxv. figs. 16-21.
27	2	Trematopora? (T. ?) corticosa, Hall.....	*	.	.	.	70	xxv. figs. 4, 5.
28	3	T. (T.) arborea, Hall.....	.	.	.	.	176	Not figured.
29	4	T. (T.) glomerata, Hall.....	.	.	.	.	176	Not figured.
		T. (T.) perspinulata, Hall.....	.	.	.	.
		T. (T.) nodosa, Hall.....	.	.	.	.
30	15	Orthopora, s. g., Hall, 1886.					16	xi. figs. 1-8; xiii. figs. 1-3; xxiii. fig. 1.
31	1	Trematopora (O.) regularis, Hall.....	*	.	*	.	71	xxv. figs. 21, 28; xxvi. figs. 5, 6.
32	2	Trematopora (O.) regularis, Hall.....	*	.	.	.	17	xi. figs. 9-11; xxiii. fig. 5.
33	3	T. (O.) ovatipora, Hall.....	*	.	.	.	17	xi. fig. 12; xxiii. fig. 9.
34	4	T. (O.) canaliculata, Hall.....	*	.	.	.	18	xi. figs. 15, 17-20; xxiii. figs. 11, 12.
35	5	T. (O.) rhombifera, Hall.....	*	.	*	.	71	xxv. fig. 29; xxvi. figs. 3, 4.
36	6	T. (O.) rhombifera, Hall.....	*	.	.	.	19	xi. figs. 13, 14; xxiii. figs. 7, 8.
37	7	T. (O.) parallela, Hall.....	*	.	.	.	....	Expl. xxiii. fig. 2.
38	8	T. (O.) granilinea, Hall.....	*	.	.	.	70	Expl. xxiii. fig. 10.
39	9	T. (O.) nodosa, Hall.....	*	.	.	.	70	xxvi. figs. 7, 8.
40	10	T. (O.) scutulara, Hall.....	*	.	.	.	176	Not figured.
41	11	T. (O.) polyzona, Hall.....	*	.	.	.	177	lvi. fig. 10; lvi. figs. 1, 6.
42	12	T. (O.) subquadrata, Hall.....	*	.	.	.	178	iv. fig. 8; lvi. fig. 2.
		T. (O.) hexagona, Hall.....	*	.	.	.	179	iv. fig. 9; lvi. fig. 5.
		T. (O.) reticulata, Hall.....	*	.	.	.	179	iv. fig. 2; lvi. fig. 3.
		T. (O.) carinata, Hall.....	*	.	.	.		

43	14	T. (O.) tortulina, Hall.....	180	lvi. fig. 9.
44	15	T. (O.) incerta, Hall.....	181	iv. figs. 3-6; lvi. fig. 19.
45	16	T. (O.) hispidula, Hall.....	182	iv. figs. 27-30; lvi. figs. 16-18.
46	17	T. (O.) elongata, Hall.....	183	iv. fig. 11; lvi. fig. 15.
47	18	T. (O.) ornata, Hall.....	184	iv. fig. 1; lvi. fig. 4.
48	19	T. (O.) immersa, Hall.....	185	iv. fig. 11.
49	20	T. (O.) interplana, Hall.....	186	iv. fig. 12.
50	21	T. (O.) granulifera, Hall.....	186	Not figured.
51	22	T. (O.) ? transversa, Hall.....	187	iv. fig. 12; lvi. figs. 13, 14.
52	23	T. (O.) ? orbipora, Hall.....	188	iv. figs. 13, 14; lvi. fig. 8.
53	16	Tropidopora, Hall, 1886.	71	xxv. figs. 25, 26.
54	17	Diamesopora, Hall, 1852.	19	x. figs. 14-19; xxiii. a, fig. 7.
55	1	D. constricta, Hall.....	20	x. figs. 20, 21.
56	2	D. dispersa, Hall.....	72	xxvi. figs. 9, 10.
57	3	D. camerata, Hall.....	73	xxv. figs. 8-10.
58	18	Acanthoclema, Hall, 1886.	73	xxviii. fig. 3.
59	1	A. alternatum, Hall.....	73	xxviii. fig. 2.
60	2	A. ovatum, Hall.....	74	xxviii. figs. 6, 7.
61	3	A. divergens, Hall.....	190	iv. figs. 13-17; lvi. figs. 19, 20.
62	4	A. triseriale, Hall.....	191	iv. figs. 18-26.
63	5	A. scutellatum, Hall.....	192	iv. fig. 7; lvi. fig. 7.
64	6	A. Hamiltonense, Nicholson.....	193	lxvi. figs. 20-22.
65	7	A. sulcatum, Hall.....	194	lxvi. figs. 14-16.
66	19	Bactropora, Hall, 1887.	74	xxv. figs. 30-36.
67	1	B. granistrata, Hall.....	193	lxvi. figs. 17-19.
68	2	B. curvata, Hall.....	21	xl. figs. 23, 24.
69	20	Nemataxis, Hall, 1886.	21	xli. figs. 1-9; xlii. fig. 9; xxiii. a, fig. 6.
70	1	N. fibrosus, Hall.....	22	xli. figs. 10-17; xxiii. a, fig. 14.
71	2	N. simplex, Hall.....	75	xxv. figs. 6, 7; xxvi. figs. 18, 19.
72	31	Callopora, Hall, 1852.	75	xxv. figs. 1-3.
73	1	C. oppleta, Hall.....	24	xl. figs. 25-29; xxiii. figs. 15-19.
74	2	C. cellulosa, Hall.....	25	xl. figs. 30, 31.
75	3	C. perelegans, Hall.....	25	xl. figs. 32-34; xlii. figs. 5-8; xxiii. fig. 3.
76	4	C. multiseriata, Hall.....	26	xl. figs. 35-37.
77	5	C. geniculata, Hall.....	27	xl. figs. 38-41; xxiii. figs. 13, 14.
78	22	Callotrypa, s. g., Hall, 1887.	27	xlii. fig. 10; xxiii. fig. 6.
79	1	Callopora (C.) macropora, Hall.....		
80	2	C. (C.) macropora var. signata, Hall.....		
81	3	C. (C.) heteropora, Hall.....		
82	4	C. (C.) unispina, Hall.....		
83	5	C. (C.) striata, Hall.....		
84	6	C. (C.) coullifera, Hall.....		

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79	7	Callotrypa — (Continued).						
80	8	C. (C.) paucipora, Hall.	*	.	.	*	189	Expl. xxiii, fig. 21. Not figured.
		C. (C.) internodata, Hall.	.	.	.	.
81	23	Cœlocaulis, s. g., Hall, 1887.						
82	1	Callopora (C.) venusta, Hall.	*	.	.	.	23	xii. figs. 20-24; xxiii. a, figs. 1-3, 4 (?) 5.
83	2	C. (C.) mediopora, Hall.	*	.	.	.	23	xiv. fig. 18; xxiii. a, figs. 11-13.
84	3	C. (C.) aculeolata, Hall.	*	.	.	.	76	xvi. figs. 16, 17.
85	4	C. (C.) irregularis, Hall.	*	.	.	.	76	xxvi. figs. 11-15.
	5	C. (C.) Hyale, Hall.	.	.	.	.	76	xii. figs. 18, 19.
86	24	Lichenalia, Hall, 1852.						
87	1	L. crassa, Hall.	*	.	.	.	30	xi. figs. 21, 22.
88	2	L. maculosa, Hall.	*	.	.	.	30	xiv. figs. 1-8.
89	3	L. tortu, Hall.	*	.	.	.	31	xv. figs. 1-5, 7.
90	4	L. serialis, Hall.	*	.	.	.	32	xiii. figs. 17, 18; xv. fig. 6.
91	5	L. distans, Hall.	*	.	.	.	32	xv. figs. 8, 9.
92	6	L. lunata Rominger.	*	.	.	.	77	xxxi. figs. 1-9.
93	7	L. lunata, var. tubulata, Hall.	.	.	.	.	78	xxxi. figs. 28, 29.
94	8	L. substellata, Hall.	.	.	.	.	78	xxvi. fig. 26; xxx. figs. 1-11.
95	9	L. bistriata, Hall.	.	.	.	.	79	xxxi. figs. 6-14.
96	10	L. geometrica, Hall.	.	.	.	.	79	xxxi. figs. 21-23.
97	11	L. ovata, Hall.	.	.	.	.	80	xxxi. figs. 1-5.
98	12	L. alternata, Hall.	.	.	.	.	80	xxxi. figs. 39-41.
99	13	L. conulata, Hall.	.	.	.	.	81	xxxi. figs. 10-14.
100	14	L. subcava, Hall.	.	.	.	.	81	xxvi. figs. 23-25.
101	15	L. permarginata, Hall.	.	.	.	.	82	xxvi. fig. 20.
102	16	L. stellata, Hall.	.	.	.	.	186	xviii. figs. 15, 16.
103	17	L. subtrigona, Hall.	.	.	.	.	196	Not figured.
104	18	L. distans, Hall.	.	.	.	.	197	Not figured.
105	19	L. vesiculata, Hall.	.	.	.	.	198	lvi. figs. 14-19; lix. figs. 1, 14.
106	20	L. ramosa, Hall.	.	.	.	.	199	Not figured.
107	21	L. colliculata, Hall.	.	.	.	.	200	Not figured.
108	22	L. enitellata, Hall.	.	.	.	.	203	lxiv. figs. 1, 2.
109	23	L. cornuta, Hall.	.	.	.	.	203	Not figured.
110	24	L. confusa, Hall.	.	.	.	.	204	Not figured.
	25	L. bullata, Hall.	.	.	.	.	205	lvii. figs. 12, 13.

111	26	<i>L. operculata</i> , Hall.....	.	.	.	.	.	.	205	Not figured.
112	27	<i>L. pustulosa</i> , Hall.....	.	.	.	.	.	.	206	Not figured.
113	28	<i>L. tessellata</i> , Hall.....	.	.	.	.	.	.	207	Not figured.
114	25	<i>Plectroypa</i> , s. g., Hall, 1886.	.	.	.	.	.	.	82	xxxl. figs. 21-27.
115	1	<i>Lichenalia</i> (<i>P.</i>) <i>pyriformis</i> , Hall.....	.	.	.	.	.	.	83	xxxl. figs. 30-38.
116	2	<i>L. (P.) clivulata</i> , Hall.....	.	.	.	.	.	.	84	xxx. figs. 23-31.
117	3	<i>L. (P.) granifera</i> , Hall.....	.	.	.	.	.	.	84	xxxvi. figs. 21, 22, 27; xxx. figs. 12-20.
118	4	<i>L. (P.) denticulata</i> , Hall.....	.	.	.	.	.	.	85	xxx. figs. 24-27.
119	26	<i>Odontotrypa</i> , s. g., Hall, 1886.	.	.	.	.	.	.	287	xxv. figs. 11, 12.
120	1	<i>Lichenalia</i> (<i>O.</i>) <i>alveata</i> , Hall.....	.	.	.	.	.	.	86	xxv. figs. 13-15.
121	2	<i>Lichenotrypa</i> , s. g., Ulrich, 1886.	.	.	.	.	.	.	87	xxxl. figs. 19, 20.
122	29	<i>Lichenalia</i> (<i>L.</i>) <i>longispina</i> , Hall.....	.	.	.	.	.	.	85	xxxl. figs. 15-18.
123	30	<i>Selenopora</i> , s. g., Hall, 1886.	.	.	.	.	.	.	99	xxxl. figs. 36, 37.
124	1	<i>Lichenalia</i> (<i>S.</i>) <i>crenata</i> , Hall.....	.	.	.	.	.	.	99	xxxl. figs. 34, 35.
125	2	<i>L. (S.) complexa</i> , Hall.....	.	.	.	.	.	.	27	xiv. figs. 9-12; xxiii. a. figs. 8-10.
126	29	<i>Glossotrypa</i> , s. g., Hall, 1887.	.	.	.	.	.	.	28	xiv. figs. 13, 14; xxiii. fig. 4.
127	1	<i>Lichenalia</i> ? (<i>G.</i>) <i>paliformis</i> , Hall.....	.	.	.	.	.	.	29	Not figured.
128	30	<i>Phractopora</i> , Hall, 1881.....	.	.	.	.	.	.	87	xxx. figs. 21-23.
129	1	<i>P. cristata</i> , Hall.....	.	.	.	.	.	.	87	xxxii. figs. 15-20.
130	2	<i>P. cristata</i> , var. <i>lineata</i> , Hall.....	.	.	.	.	.	.	209	Not figured.
131	31	<i>Fistulipora</i> , McCoy, 1849.	.	.	.	.	.	.	210	lviii. figs. 9-14.
132	1	<i>F. ponderosa</i> , Hall.....	.	.	.	.	.	.	211	lviii. figs. 1-5.
133	2	<i>F. parasticta</i> , Hall.....	.	.	.	.	.	.	212	lviii. figs. 17, 18.
134	3	<i>F. triloba</i> , Hall.....	.	.	.	.	.	.	213	Not figured.
135	4	<i>F. lamellata</i> , Hall.....	.	.	.	.	.	.	214	lviii. figs. 6-8.
136	5	<i>F. intercellata</i> , Hall.....	.	.	.	.	.	.	215	lviii. figs. 19, 20.
137	6	<i>F. longimaculata</i> , Hall.....	.	.	.	.	.	.	216	lviii. figs. 1, 2, 5.
138	7	<i>F. varipora</i> , Hall.....	.	.	.	.	.	.	217	lviii. figs. 20; lix. fig. 3.
139	8	<i>F. confertipora</i> , Hall.....	.	.	.	.	.	.	218	Not figured.
140	9	<i>F. serobiculata</i> , Hall.....	.	.	.	.	.	.	219	lix. fig. 4.
141	10	<i>F. umbilicata</i> , Hall.....	.	.	.	.	.	.	220	lviii. fig. 2.
142	11	<i>F. serrulata</i> , Hall.....	.	.	.	.	.	.	221	lix. fig. 2.
143	12	<i>F. plana</i> , Hall.....	.	.	.	.	.	.	222	Not figured.
144	13	<i>F. unilinea</i> , Hall.....	.	.	.	.	.	.	223	Not figured.
145	14	<i>F. interaspera</i> , Hall.....	.	.	.	.	.	.	225	lvii. figs. 3, 4.
146	15	<i>F. segregata</i> , Hall.....	.	.	.	.	.	.	226	lvii. figs. 8-11.
147	16	<i>F. micropora</i> , Hall.....	.	.	.	.	.	.
148	17	<i>F. involvens</i> , Hall.....	.	.	.	.	.	.
149	18	<i>F. trifaria</i> , Hall.....	.	.	.	.	.	.
150	19	<i>F. triangularis</i> , Hall.....	.	.	.	.	.	.
151	20	<i>F. minuta</i> (?), Rominger.....		
152	21	<i>F. spheroides</i> , Hall.....		
153	22	<i>F. hemispherica</i> , Hall.....		

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		<i>Fistulipora</i> —(Continued).						
147	23	<i>F. constricta</i> , Hall.....	.	.	.	*	227	Not figured.
148	24	<i>F. multiseptata</i> , Hall.....	.	.	.	*	228	lix. figs. 10, 11.
149	25	<i>F. digitata</i> , Hall.....	.	.	.	*	229	lix. figs. 12, 13.
150	26	<i>F. densa</i> , Hall.....	.	.	.	*	231	Not figured.
151	27	<i>F. decipiens</i> , Hall.....	.	.	.	*	232	lix. fig. 9.
152	28	<i>F. subtilis</i> , Hall.....	.	.	.	*	233	Not figured.
	32	<i>Favicella</i> , Hall, 1887.						
153	1	<i>F. inclusa</i> , Hall.....	.	.	.	*	234	lviii. figs. 21, 22.
	33	<i>Ceramopora</i> , Hall, 1852.						
154	1	<i>C. maculata</i> , Hall.....	.	.	.	*	33	xvi. figs. 5-11.
155	2	<i>C. laevicollis</i> , Hall.....	.	.	.	*	33	xvi. figs. 1, 2.
156	3	<i>C. parvicella</i> , Hall.....	.	.	.	*	34	xvi. figs. 3, 4.
157	4	<i>C. imbricella</i> , Hall.....	.	.	.	*	236	Not figured.
158	5	<i>C. (Berenicea) maxima</i> , Hall.....	.	.	.	*	34	xvi. fig. 12
159	6	<i>C. (Lichenalia) foliacea</i> , Hall.....	.	.	.	*	235	lvii. figs. 6, 7.
	34	<i>Paleschara</i> , Hall, 1874.						
160	1	<i>P. incrustans</i> , Hall.....	.	.	.	*	35	xvi. figs. 15-21.
161	2	<i>P. pallida</i> , Hall.....	.	.	.	*	35	xvi. figs. 13, 14.
162	3	<i>P. ? dissimilis</i> , Hall.....	.	.	.	*	35	xv. figs. 10-13.
163	4	<i>P. ? tenuis</i> , Hall.....	.	.	.	*	36	Not figured.
164	5	<i>P. ? (Lichenalia) ? bilateralis</i> , Hall.....	.	.	.	*	36	xvi. figs. 22, 23.
165	6	<i>P. concentrica</i> , Hall.....	.	.	.	*	67	xvi. fig. 24.
166	7	<i>P. pertenuis</i> , Hall.....	.	.	.	*	237	Not figured.
167	8	<i>P. intercella</i> , Hall.....	.	.	.	*	237	Not figured.
168	9	<i>P. reticulata</i> , Hall.....	.	.	.	*	237	Not figured.
169	10	<i>P. variacella</i> , Hall.....	.	.	.	*	237	Not figured.
170	11	<i>P. amplexans</i> , Hall.....	.	.	.	*	237	Not figured.
	35	<i>Coscinum</i> , Keyserling, 1846.						
171	1	<i>C. striatum</i> , Hall.....	.	.	.	*	88	xxiii. figs. 20, 21.
172	2	<i>C. striatum</i> , Hall.....	.	.	.	*	239	lxiv. figs. 13-16.

173	36	<i>Coscinotrypa</i> , Hall, 1886.	.....	.....	.....	.....	89	xxix. figs. 29-35; xxxiii. figs. 22-25.
	1	<i>C. cribriformis</i> , Prout, var. <i>carinata</i> , Hall.	.....	.....	.....	.....
174	37	<i>Coscinella</i> , Hall, 1887.	.....	.....	.....	.....	239	lxiv. figs. 9-12.
	1	<i>C. elegantula</i> , Hall.	.....	.....	.....	.....
175	38	<i>Garmella</i> , Hall, 1887.	.....	.....	.....	.....	240	lxiv. figs. 5-8.
	1	<i>C. scitacea</i> , Hall.	.....	.....	.....	.....
176	39	<i>Ptilodictya</i> , Lonsdale, 1839.	.....	.....	.....	.....	38	xvii. figs. 1-4; xxiii. a, fig. 20.
	1	<i>P. lirata</i> , Hall.	.....	.....	.....	.....	39	xiii. fig. 14; xviii. 7-12; xxiii. a, fig. 15.
177	2	<i>P. tenuis</i> , Hall.	.....	.....	.....	.....	40	xviii. figs. 13-18.
178	3	<i>P. nebulosa</i> , Hall.	.....	.....	.....	.....	270	lx. figs. 7, 8.
179	4	<i>P. parvifolia</i> , Hall.	.....	.....	.....	.....	271	lx. figs. 9-12.
180	5	<i>P. plumosa</i> , Hall.	.....	.....	.....	.....	272	lx. fig. 13.
181	6	<i>P. retiformis</i> , Hall.	.....	.....	.....	.....	273	Not figured.
182	7	<i>P. scutulata</i> , Hall.	.....	.....	.....	.....
183	40	<i>Aerogonia</i> , Hall, 1881.	.....	.....	.....	.....	267	lxiii. figs. 17-15.
	1	<i>A. prolifera</i> , Hall.	.....	.....	.....	.....
184	41	<i>Stictopontina</i> , s. g., Hall, 1887.	.....	.....	.....	.....	269	Not figured.
	1	<i>Stictopora</i> (S.) <i>claviformis</i> , Hall.	.....	.....	.....	.....
185	42	<i>Rhindictya</i> , Ulrich, 1882.	.....	.....	.....	.....	40	xvii. figs. 5, 6; xxiii. a, figs. 18, 18.
	1	<i>R. ? granulosa</i> , Hall.	.....	.....	.....	.....
186	43	<i>Stictopora</i> , Hall, 1847.	.....	.....	.....	.....	37	xiii. figs. 12, 13; xxiii. a, fig. 16.
	1	<i>S. papillosa</i> , Hall.	.....	.....	.....	.....	37	xxiii. a, fig. 22.
187	2	<i>S. obsolata</i> , Hall.	.....	.....	.....	.....	38	xl. fig. 16; xxiii. a, fig. 17.
188	3	<i>S. granatula</i> , Hall.	.....	.....	.....	.....	....	Expl. xxiii. a, fig. 21.
189	4	<i>S. alternata</i> , Hall.	.....	.....	.....	.....	90	xxvii. figs. 20-35; xxviii. figs. 21, 22.
190	5	<i>S. Gilberti</i> , Meek.	.....	.....	.....	.....	91	xxvii. figs. 5-11.
191	6	<i>S. crescens</i> , Hall.	.....	.....	.....	.....	91	xxviii. figs. 15, 16.
192	7	<i>S. rigida</i> , Hall.	.....	.....	.....	.....	92	xxviii. figs. 12-14.
193	8	<i>S. fruticosa</i> , Hall.	.....	.....	.....	.....	93	xxvii. figs. 12-19; xxviii. figs. 23, 23 a.
194	9	<i>S. ovatifera</i> , Hall.	.....	.....	.....	.....	93	xxvii. figs. 2-4.
195	10	<i>S. vermicula</i> , Hall.	.....	.....	.....	.....	94	xxviii. figs. 24-26.
196	11	<i>S. invertis</i> , Hall.	.....	.....	.....	.....	95	xxviii. figs. 17-20.
197	12	<i>S. semistriata</i> , Hall.	.....	.....	.....	.....	96	xxix. figs. 27, 28.
198	13	<i>S. rhomboides</i> , Hall.	.....	.....	.....	.....	96	xxix. figs. 26, 27.
199	14	<i>S. peraceta</i> , Hall.	.....	.....	.....	.....	96	xxviii. figs. 4, 5; xxvii. fig. 1.
200	15	<i>S. linearis</i> , Hall.	.....	.....	.....	.....	241	lx. figs. 1-18.
201	16	<i>S. incisurata</i> , Hall.	.....	.....	.....	.....	243	lx. figs. 26, 27.
202	17	<i>S. trilineata</i> , Hall.	.....	.....	.....	.....	245	lx. fig. 23.
203	18	<i>S. rectilinea</i> , Hall.	.....	.....	.....	.....	246	lx. figs. 18-22.
204	19	<i>S. tumulosa</i> , Hall.	.....	.....	.....	.....	246	lx. fig. 22.
205	20	<i>S. striata</i> , Hall.	247	lx. fig. 17.
206	21	<i>S. sinuosa</i> , Hall.	248	lxiii. fig. 24.
207	22	<i>S. ovata</i> , Hall.		

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208	23	<i>S. incrassata</i> , Hall.....	.	.	.	*	246	lxii. figs. 1-6.
209	24	<i>S. limata</i> , Hall.....	.	.	.	*	250	lxii. figs. 14-16.
210	25	<i>S. subrigida</i> , Hall.....	.	.	.	*	251	lx. fig. 21.
211	26	<i>S. crenulata</i> , Hall.....	.	.	.	*	252	lx. fig. 22.
212	27	<i>S. angularis</i> , Hall.....	.	.	.	*	252	lx. fig. 23.
213	28	<i>S. recta</i> , Hall.....	.	.	.	*	253	Not figured.
214	29	<i>S. bifurcata</i> , Hall.....	.	.	.	*	254	lxiii. fig. 17.
215	30	<i>S. palmipes</i> , Hall.....	.	.	.	*	255	lx. figs. 19, 20.
216	31	<i>S. lobata</i> , Hall.....	.	.	.	*	256	Not figured.
217	32	<i>S. granifera</i> , Hall.....	.	.	.	*	257	lx. figs. 1-6.
218	33	<i>S. divergens</i> , Hall.....	.	.	.	*	257	lxiii. figs. 18, 19.
219	34	<i>S. permarginata</i> , Hall.....	.	.	.	*	258	lxii. fig. 16.
220	35	<i>S. interseriata</i> , Hall.....	.	.	.	*	259	lxii. figs. 7-12.
221	36	<i>S. recubans</i> , Hall.....	.	.	.	*	260	lxii. figs. 20, 21.
222	37	<i>S. subcarinata</i> , Hall.....	.	.	.	*	261	lxiii. figs. 1-6.
44		<i>Thamnotrypa</i> , Hall, 1887.						
223	1	<i>T. divaricata</i> , Hall.....	.	.	*	.	101	xxxiii. figs. 9, 10.
45		<i>Tanlopore</i> , Nicholson, 1874.						
224	1	<i>T. exigua</i> , Nicholson.....	.	.	.	*	263	lxii. figs. 15-26.
46		<i>Prismopora</i> , Hall, 1881.						
225	1	<i>P. triquetra</i> , Hall.....	.	.	*	.	97	xxviii. figs. 8-10; xxix. figs. 9-15.
226	2	<i>P. paucirama</i> , Hall.....	.	.	*	.	98	xxviii. fig. 11; xxix. figs. 16, 17.
227	3	<i>P. sparsipora</i> , Hall.....	.	.	*	.	288	xxxii. figs. 24-28.
228	4	<i>P. dilatata</i> , Hall.....	.	.	*	.	265	lxii. figs. 13, 14.
229	5	<i>P. lata</i> , Hall.....	.	.	.	*	266	Not figured.
47		<i>Scalariopora</i> , Hall, 1881.						
230	1	<i>S. scalariformis</i> , Hall.....	.	.	*	.	100	xxix. figs. 4-8.
231	2	<i>S. subconceava</i> , Hall.....	.	.	*	.	100	xxix. figs. 1-3.
48		<i>Semionopora</i> , Hall, 1881.						
232	1	<i>S. bisigigmata</i> , Hall.....	.	.	.	*	262	lxii. figs. 27-29.

49	1	Intrapora, Hall, 1831.	97	xxix. figs. 18-26.
		I. puteolata, Hall.....		
50		Thamniscus, King, 1849.		
	1	T. variolata, Hall.....	41	xxii. figs. 34-46.
	2	T. fruticella, Hall.....	42	xxii. fig. 33.
	3	T. ? Classels, Hall.....	43	xxii. figs. 24-30
	4	T. ? Nysa, Hall.....	42	xxii. figs. 31, 32, 47, 48.
	5	T. multiramus, Hall.....	104	xxxlii. figs. 1-6.
	6	T. pauciramus, Hall.....	274	Not figured.
	7	T. nanus, Hall.....	292	lxvi. figs. 11-13.
51		Fenestella, Lonsdale, 1839.		
	1	F. crebripora, Hall.....	43	xx. figs. 1-3.
	2	F. juncus, Hall.....	44	xx. figs. 16-18.
	3	F. Cleia, Hall.....	45	xx. figs. 14, 15.
	4	F. Hestia, Hall.....	45	xx. 12, 13.
	5	F. Elysie, Hall.....	46	xi. figs. 11-13.
	6	F. Noe, Hall.....	47	xiii. figs. 19-22.
	7	F. Spio, Hall.....	47	xix. fig. 16.
	8	F. Althea, Hall.....	48	xix. figs. 17-19.
	9	F. Adraste.....	48	xx. figs. 19-22.
	10	F. Sylvia, Hall.....	49	xx. figs. 4-7.
	11	F. Philia, Hall.....	50	xx. figs. 9-11.
	12	F. Thyene, Hall.....	50	xxi. figs. 1-6.
	13	F. Coronis, Hall.....	51	xxi. figs. 10-13.
	14	F. Idalia, Hall.....	52	xxi. figs. 6-9.
	15	F. quadrula, Hall.....	53	xxii. figs. 19-22.
	16	F. adornata, Hall.....	56	xxii. figs. 7, 8.
	17	F. variapora, Hall.....	104	xxxv. fig. 17; xlv. figs. 1-13.
	18	F. tenella, Hall.....	105	xiv. figs. 18, 19.
	19	F. pertenuis, Hall.....	106	xiv. figs. 22, 23.
	20	F. parallela, Hall.....	107	xiv. figs. 8-18.
	21	F. curvuncula, Hall.....	107	xvi. figs. 1-5.
	22	F. confertipora, Hall.....	108	xvi. figs. 7-11, 17-21.
	23	F. stellata, Hall.....	109	xiv. figs. 14, 15. xlvii. figs. 20-36.
	24	F. serrata, Hall.....	110	xlv. figs. 11, 19.
	25	F. verrucosa, Hall.....	110	xlii. fig. 11; xlvii. figs. 22-24.
	26	F. depressa, Hall.....	111	xiv. figs. 16-17.
	27	F. aqualis, Hall.....	112	xvi. figs. 27-31.
	28	F. biseriala.....	113	xlii. figs. 16-18.
	29	F. peculiaris, Hall.....	113	xlii. figs. 19-21.
	30	F. disparida, Hall.....	114	xlv. figs. 1-4.
	31	F. singularitas.....	114	xlv. figs. 12-16.
	32	F. proceritas, Hall.....	115	xlv. figs. 32, 35, 36.
	33	F. sinuosa, Hall.....	116	xlv. figs. 5, 6.
	34	F. tuberculata, Hall.....	116	xlv. figs. 25, 26, 33, 34.
	35	F. clathrata, Hall.....	117	Not figured.
	36	F. erectipora, Hall.....	118	l. figs. 1, 16.

SYNOPTICAL TABLE OF THE GENERA AND SPECIES, ETC.—(Continued).

Serial number.	Species number.	NAME AND AUTHOR.	Lower Heiderberg.	Schöharie grit.	Corniferous.	Hamilton.	Pare.	Plates and Figures.
Fenestella—(Continued).								
277	37	<i>F. cultrata</i> , Hall.....	.	.	*	.	119	l. figs. 1-5.
278	38	<i>F. lunulata</i> , Hall.....	.	.	*	.	121	xlvii. figs. 1-10.
279	39	<i>F. bi-imbriata</i> , Hall.....	.	.	*	.	122	xlviii. figs. 6-11.
280	40	<i>F. infernuta</i> , Hall.....	.	.	*	.	123	l. figs. 12-17.
281	41	<i>F. granifera</i> , Hall.....	.	.	*	.	125	l. figs. 12-14, 16.
282	42	<i>F. semicircularis</i> , Hall.....	.	.	*	.	125	xlix. figs. 11-22.
283	43	<i>F. permarginata</i> , Hall.....	.	.	*	.	127	l. figs. 1-10.
284	44	<i>F. biserrulata</i> , Hall.....	.	.	*	.	128	l. figs. 6-11.
285	45	<i>F. latijunctura</i> , Hall.....	.	.	*	.	128	xlviii. figs. 1-5.
286	46	<i>F. perplexa</i> , Hall.....	.	.	*	.	130	Not figured.
Refeporina, s. g., D'Orbigny.								
287	52	<i>Fenestella</i> (R.) <i>rhombifera</i> , Hall.....	.	.	*	.	120	l. figs. 18, 19.
288	2	<i>F. (R.) coalescens</i> , Hall.....	.	.	*	.	120	Not figured.
Fenestranora, s. g., Hall, 1884.								
289	53	<i>Fenestella</i> (F.) <i>biperforata</i> , Hall.....	.	.	.	*	286	lxvi. figs. 34-39.
Unitrypa, s. g., Hall, 1885.								
290	54	<i>Fenestella</i> (U.) <i>præcursor</i> , Hall.....	*	.	.	.	54	xxi. figs. 14-18.
291	1	<i>F. (U.) Nervia</i> , Hall.....	*	.	.	.	55	xxii. figs. 1-3, 6, (9, 10.)?
292	2	<i>F. (U.) Nervia</i> , var. <i>constricta</i> , Hall.....	*	.	.	.	56	xxii. figs. 11, 12.
293	3	<i>F. (U.) acanthis</i> , Hall.....	.	.	*	.	131	l. figs. 1-6.
294	4	<i>F. (U.) acanthis</i> , var. <i>inclinis</i> , Hall.....	.	.	*	.	132	Not figured.
295	5	<i>F. (U.) projecta</i> , Hall.....	.	.	*	.	132	Not figured.
296	6	<i>F. (U.) transversa</i> , Hall.....	.	.	*	.	132	Not figured.
297	7	<i>F. (U.) nana</i> , Hall.....	.	.	*	.	133	Not figured.
298	8	<i>F. (U.) stipitata</i> , Hall.....	.	.	*	.	134	l. figs. 7-14.
299	9	<i>F. (U.) regularis</i> , Hall.....	.	.	*	.	135	l. figs. 16-23.
300	10	<i>F. (U.) lata</i> , Hall.....	.	.	*	.	136	l. figs. 1-10.
301	11	<i>F. (U.) feticus</i> , Hall.....	.	.	*	.	137	l. figs. 11-15.
302	12	<i>F. (U.) acclivis</i> , Hall.....	.	.	*	.	138	l. figs. 16-23.
303	13	<i>F. (U.) pernodosus</i> , Hall.....	.	.	*	.	139	l. figs. 1-11.
304	14	<i>F. (U.) elegantissima</i> , Hall.....	.	.	*	.	140	l. figs. 12-17.
305	15	<i>F. (U.) fastigiatu</i> , Hall.....	.	.	*	.	141	l. figs. 1-6.
306	16	<i>F. (U.?) consimilis</i> , Hall.....	.	.	*	.	142	l. figs. 7-9.

[illegible]

SYNOPTICAL TABLE OF THE GENERA AND SPECIES, ETC.—(Continued).

Serial number.	Species number.	NAME AND AUTHOR.	Lower Helderbere.	Schobharle erit.	Corniferous.	Hamilton.	Page.	Plates and Figures.
		<i>Polypora</i> —(Continued).						
349	35	<i>F. (P.) subnutans</i> , Hall.....	..	..	*	..	167	xl. figs. 3-5.
350	36	<i>F. (P.) brevisulcata</i> , Hall.....	..	..	*	..	168	xl. figs. 12-15.
351	37	<i>F. (P.) striatopora</i> , Hall.....	..	..	*	..	168	xl. figs. 16-19.
352	38	<i>F. (P.) laevinodata</i> , Hall.....	..	..	*	..	169	xlii. figs. 12-15.
353	39	<i>F. (P.) rustica</i> , Hall.....	..	..	*	..	169	xlii. figs. 10-13.
354	40	<i>F. (P.) crebescens</i> , Hall.....	..	..	*	..	170	xlv. figs. 20, 21.
	59	<i>Ptiloporella</i> , s. g., Hall, 1885.						
355	1	<i>Fenestella (P.) latitescens</i> , Hall.....	..	..	*	..	171	Not figured.
356	2	<i>F. (P.) inequalis</i> , Hall.....	..	..	*	..	171	Not figured.
	60	<i>Ptilopora</i> , s. g., Hall, 1885.						
357	1	<i>Fenestella (P.) conica</i> , Hall.....	..	..	*	..	172	xlii. figs. 2-4.
358	2	<i>F. (P.) pinnata</i> , Hall.....	..	..	*	..	172	xlii. figs. 5, 6.
359	3	<i>F. (P.) disparilis</i> , Hall.....	..	..	*	..	173	xlii. figs. 7, 8.
360	4	<i>F. (P.) sinistralis</i> , Hall.....	..	..	*	..	174	xlii. fig. 9.
	61	<i>Ptilopora</i> , McCoy, 1849.						
361	1	<i>P. striata</i> , Hall.....	..	..	*	..	283	lxvi. figs. 30-33.
362	2	<i>P. infrequens</i> , Hall.....	..	..	*	..	284	lxvi. figs. 26-29.
363	3	<i>P. nodosa</i>.....	..	..	*	..	285	lxvi. fig. 25.
	62	<i>Glauconome</i> , Goldfuss, 1826.						
364	1	<i>G. sinuosa</i> , Hall.....	..	..	*	..	101	xxxiii. figs. 11, 12.
365	2	<i>G. tenuistriata</i> , Hall.....	..	..	*	..	102	xxxiii. figs. 15-19.
366	3	<i>G. nodata</i> , Hall.....	..	..	*	..	102	xxxiii. figs. 13, 14.
367	4	<i>G. carinata</i> , Hall.....	..	..	*	..	273	lxvi. figs. 23, 24.
	63	<i>Ichthyorachis</i> , McCoy, 1844.						
368	1	<i>I. Nereis</i> , Hall.....	*	..	..	..	66	xxii. figs. 19-21.
	64	<i>Criscinella</i> , Hall, 1883.						
369	1	<i>C. scrobiculata</i> , Hall.....	..	..	*	..	103	xxxiii. figs. 6-8.
	65	<i>Cystopora</i> , Hall, 1881.						
370	1	<i>C. genticulata</i> , Hall.....	..	..	*	..	103	lxvi. figs. 7-10.

371	66	Clonopora, Hall, 1881.	.	.	.	.	.	.	289	lxvi. figs. 1, 2.
372	1	C. fasciculata, Hall.....	.	.	.	.	.	.	289	lxvi. figs. 3, 4.
373	3	C. semireducta, Hall.....	.	.	.	.	.	.	289	lxvi. figs. 5, 6.
374	67	Reptaria, Rolle, 1851.	.	.	.	.	.	.	274	lxv. figs. 17-19.
375	2	R. stolonifera, Rolle.....	.	.	.	.	.	.	276	Not figured.
376	68	R. nodata, Hall.....	.	.	.	.	.	.	277	lxv. figs. 12, 13.
377	1	Hederella, Hall, 1881.	.	.	.	.	.	.	277	lxv. figs. 1-8, 14, 16?
378	2	H. ciliatosa, Hall.....	.	.	.	.	.	.	278	lxv. figs. 9-11.
379	3	H. canadensis, Nicholson.....	.	.	.	.	.	.	279	Not figured.
380	4	H. filiformis, Billings.....	.	.	.	.	.	.	280	lxv. fig. 15.
381	5	H. conferta, Hall.....	.	.	.	.	.	.	281	lxv. figs. 20, 21.
382	69	H. magna, Hall.....	.	.	.	.	.	.	282	lxiv. figs. 3, 4.
383	70	Hernodia, Hall, 1871.	.	.	.	.	.	.	290	xxiv. figs. 3-11.
384	1	H. hemifusa, Hall.....	.	.	.	.	.	.	291	xxiv. figs. 1, 2.
385	2	Botryllonpora, Nicholson.	.	.	.	.	.	.	291	xxiv. figs. 12-14.
386	71	B. socialis, Nicholson.....	.	.	.	.	.	.	291	xxiv. figs. 12-14.
387	72	Receptaculites, De France, 1837.	107	1	158	118	118	118	290	xxiv. figs. 3-11.
388	1	R. infundibuliformis, Eaton.....	.	.	.	.	.	.	291	xxiv. figs. 1, 2.
389	2	Ischadites, Murchison.	.	.	.	.	.	.	291	xxiv. figs. 12-14.
390	73	L. squamifer, Hall.....	.	.	.	.	.	.	291	xxiv. figs. 12-14.
391	1	L. bursiformis, Hall.....	.	.	.	.	.	.	291	xxiv. figs. 12-14.
392	2	L. bursiformis, Hall.....	.	.	.	.	.	.	291	xxiv. figs. 12-14.
393	74	L. bursiformis, Hall.....	109	2	158	118	118	118	291	xxiv. figs. 12-14.

The preceding synoptical table presents a list of the genera and species, actually described in Volume VI of the Palæontology of New York. Of this number fifty species are not illustrated upon the plates, though described in the text of the volume. This omission has arisen from the limitation as to the number of plates and figures to be included in the volume, by the contract of 1883.

This contract was made after the work had been commenced and thirty-three plates already lithographed, the restriction being necessary in order to give each class of objects to be represented in the several volumes its proper proportion, without exceeding the entire appropriation for the final publication of volumes V, VI, VII and VIII.

In the beginning of this work for volume VI there was no actual or anticipated restriction in the amount of text or number of plates and the drawings were begun and continued with a view of making the result as complete as the material at our command would permit. With this object in view and having abundant material in some of the groups or families, these were very fully illustrated. When, however, the restriction was imposed it became necessary to make such a selection of the illustrations as would give a fair expression of each group, and including as many of the genera as practicable in our descriptions and illustrations.

In furtherance of this plan it became necessary to omit all the Fenestellidæ of the Hamilton Group, besides many from the Upper Helderberg Group, as already noticed. Many of the original drawings made under the earlier conditions of the work named above, still remain unutilized, but are at any time available for further illustrations of the Bryozoa.

There now remain available for such further use as may be considered desirable about 290 figures, representing about seventy-two species, chiefly of the Fenestellidæ. To illustrate these species fully would require about one hundred more figures, chiefly of the celluliferous faces of these fossils. These species are neither named nor described and the collection is of little scientific value in its present condition. Were these forms named and described the collection would become of much scientific value as containing the type specimens of the species. There are also about seventy figures of specimens described in the text of volume VI, for which there was no room upon the plates. For the same

reason there were from sixty to eighty drawings left off from the lithographed plates, for want of room, the species being represented by fewer figures than would have been desirable, could the space have been allowed. All these drawings could be arranged on plates and published in the annual reports; or they can be arranged on plates corresponding with those of the volumes and published as a supplement or arranged as part of a museum bulletin to be published with a classification of the Bryozoa.

The best and most satisfactory disposition of this material would be the publication of a supplemental volume of about twenty plates with text of 150 pages to include a synopsis and classification of the genera with the proper illustrations, together with descriptions of the new species. This would serve to give a completeness to the work which it now lacks, and which, from the great amount of new material that would be presented in the volume, we should feel it a duty to publish.

In order to have this material more immediately available for use, should it be required for publication, I propose to arrange these drawings upon cards in the form of the plates of the volume and to have the necessary drawings made for their completion; to write out the descriptions, and explanations of plates and to leave all this, together with the specimens properly labeled and arranged in a series of drawers, so that the entire material will be available for use.

The Corals and Bryozoa of the Lower Helderberg Group and the Bryozoa of the Upper Helderberg Group which have been used in the descriptions and illustrations of the volume have been arranged in drawers in the rooms of the upper story of the State Hall. All the duplicate collections of specimens have likewise been similarly arranged preparatory to labeling the whole (a work already begun). To complete the labeling will require several months of careful labor by Mr. Simpson the assistant and draughtsman in this department. At the end of February, 1888, Mr. Simpson's services were discontinued, and the material mentioned above, as practically prepared for publication, still remains in the same condition as when this report was written, with a large number of specimens remaining unlabeled and consequently of little value to science or to the Museum.

In this connection I beg leave again to urge upon the committee of the State Museum the great importance of having selected from the very large collection of fossil corals a series of specimens for their special study, leaving the remainder for disposition as duplicate collections. Until such selection is fully made it becomes impracticable to distribute any part of this collection which now occupies twenty-five large boxes, which are piled in the rotunda, four large tables of five shelves each, and 608 drawers, of which nine are filled with cut and polished specimens, and also a long wall-case in the corridor containing about 500 large specimens. I may likewise mention the fact that all the draws of the large room appropriated to the duplicate collection are filled with specimens while there remain many boxes filled with specimens which it is very desirable to have taken out and arranged.

PALÆONTOLOGY.

VOLUME VII.

The printing upon Volume VII Palæontology of New York was begun in September; the first proofs coming to hand early in October of the present year. At the time of the present writing more than one-half of the manuscript has been delivered to the printer and more than one-third of the matter is in type.

Of the proposed number of fifty-five plates, forty-five have already been lithographed, leaving ten plates in preparation and progress.

The accompanying synopsis of the contents of the volume, together with the list of plates will serve to give some more definite idea of the nature of the work in progress.

CRUSTACEA.

Subclass: ENTOMOSTRACA.

Order: TRILOBITA.

Family: Calymenidæ.

Genus: Calymene.

" Homalonotus.

Family: Bronteidæ.

Genus: Bronteus.

Family: Phacopidæ.

Genus: Phacops.

" Dalmanites.

Subgenus: Hausmannia.

" Coronura.

" Cryphæus.

" Corycephalus.

" Odontocephalus.

" Chasmops.

Family: Acidaspidæ.

Genus: Acidaspis.

Family: Lichadæ.

Genus: Lichas.

Subgenus: Terataspis.

" Ceratolichas.

" Conolichas.

" Hoplolichas.

" Arges.

" Diceranogmus.

Family: Proetidæ.

Genus: Proëtus.

" Phaëthonides.

" Cyphaspis.

Order: CIRRIPIEDIA.

Family: Lepadidæ.

Genus: Plumulites.

" Strobilepis.

Family: Balanidæ.

Genus: Protobalanus.

Order: PHYLLOPODA.

Family: Limniadiadæ.

Genus: Estheria.

" Schizodiscus.

Subclass: MEROSTOMATA.

Order: XIPHOSURA.

Family: Limulidæ.

Genus: Protolimulus.

Order: EURYPTERIDA.

Family: Eurypteridæ.

Genus: Eurypterus.

" Stytonurus.

Subclass: MALACOSTRACA.

Order: PHYLLOCARIDA.

Family: Ceratiocaridæ.

Genus: Ceratiocaris.

" Echinocaris.

" Dithyrocaris.

" Elymocaris.

" Tropicocaris.

Family: Rhinocaridæ.

Genus: Rhinocaris.

Family: Discinocaridæ.

Genus: Spathiocaris.

" Dipterocaris.

Order: DECAPODA.

Family: Carididæ.

Genus: Palæopalæmon.

PLATES OF CRUSTACEA.

OCTOBER 1, 1887.

- | | |
|-----------------------|-----------|
| I. Calymene..... | Engraved. |
| II. Homalonotus..... | Engraved. |
| III. Homalonotus..... | Engraved. |
| IV. Homalonotus..... | Engraved. |
| V. Homalonotus..... | Engraved. |
| VA. Homalonotus..... | Engraved. |
| VB. Homalonotus..... | |

VI. Phacops	Engraved.
VII. Phacops	Engraved.
VIII. Phacops	Engraved.
VIII A. Phacops	Engraved.
IX. Dal. anchiops	Engraved.
X. Dal. anchiops	Engraved.
XI. Dal. regalis	Engraved.
XI A. Dal. species	Engraved.
XI B. Dal. selenurus	Engraved.
XII. Dal. selenurus	Engraved.
XIII. Dal. aspectans	Engraved.
XIV. Dal. myrmecophorus	Engraved.
XV. Dal. myrmecophorus	Engraved.
XVI. Dal. Boothi	Engraved.
XVI A. Dal. Boothi	Engraved.
XVI B. Acidaspis	Engraved.
XVII. Lichas grandis	Engraved.
XVIII. Lichas grandis	Engraved.
XIX. Lichas	Engraved.
XIX A. Lichas	Engraved.
XIX B. Lichas	Engraved.
XX. Proëtus	Engraved.
XXI. Proëtus	Engraved.
XXII. Proëtus	Engraved.
XXIII. Proëtus	Engraved.
XXIV. Cyphaspis	Engraved.
XXV. Miscellaneous trilobites.	
XXVI. Stylonurus.	
XXVI A. Stylonurus	Engraved.
XXVIII. Protolimulus and Echinocaris.	
XXIX. Echinocaris.	
XXX. Echinocaris.	
XXXI. Echinocaris, Tropidocaris, etc.	
XXXII. Mesothyra.	
XXXIII. Mesothyra	Engraved.
XXXIV. Mesothyra	Engraved.
XXXV. Dipterocaris.	
XXXVI. Turrilepis and Protobalanus.	

For the plates yet incomplete there are about fifty original drawings to be made.

Besides the Crustacea this volume will contain a supplement to volume V, part II, including plates cxiv to cxxix, of which five are given to illustrations of Pteropoda and Annelida and the remainder to Cephalopoda of the genera Orthoceras, Gomphoceras, Cyrtoceras, Nautilus and Goniatites.

PALÆONTOLOGY.

VOLUME VIII.

Since the completion of volume V, part I, on the Lamellibranchiata the Museum collections and material prepared for this volume have been in the care and custody of Mr. C. E. Beecher, whose services I expected would be given in the final revision of the work.

He has, however, found it necessary to give most of his time to special Museum work and therefore little progress has been made in the study of Brachiopoda.

He had already, prior to 1886, prepared about 250 microscopic slides for illustrating the shell structure of nearly eighty species and about sixty photographic negatives have been taken. Unfortunately for our progress in this work no field collections in this direction have been made in many years, and the material now available in the Museum collection is entirely insufficient for any satisfactory progress in the work and quite inadequate for the purposes of the volume.

The work in preparation for a revision of the Brachiopoda was begun in 1867, after the completion of the fourth volume of the Palæontology and was continued with interruptions until 1878, at which period twenty-eight plates had already been lithographed.

In the original plan of this volume no especial limitation was considered, but it was proposed to illustrate fully all the Palæozoic genera of Brachiopoda irrespective of geographical limitations. The plates were to embrace illustrations of the external form, hinge structure, the interior of the valve with its muscular and vascular impressions together with the microscopic structure of the shell.

Since 1878, little progress has been made in the work, for this volume, except in the preparation of sections for microscopic study, little or almost no new material has been accumulated, and we are not now as well prepared to go on as we were at that date. Since the commencement of this work several important monographs have been issued in England, France, Belgium, Germany and Bohemia, the most important of these being the monographs of Mr. Davidson upon the Silurian, Devonian and Carboniferous Brachiopoda. It follows without further argument or explanation that a work planned and partially executed

more than ten years ago can not be creditably published at the present time without a modification in its scope and illustration.

Moreover, while the law of 1883 proposed and enacted a restriction upon the extent of the work as originally planned, the subject has in the meantime expanded far beyond what was known in 1867 or in 1878, and to meet these conditions the work should have been extended instead of curtailed.

In the twenty-eight plates already lithographed very full illustrations have been given of the families ORTHIDÆ, STROPHOMENIDÆ, PRODUCTIDÆ and SPIRIFERIDÆ, embracing twenty-one genera. The species have been illustrated in their external form, hinge structure, muscular and vascular markings, leaving the microscopic structure to be illustrated in subsequent plates.

There remain according to the provisions of the contract but twenty-nine (30?) plates to be made up and lithographed. In order to make the work complete these twenty-nine plates should embrace the illustration of eleven families and almost eighty genera.

This would require the illustration of nearly three genera upon each plate, beside the illustration of microscopic structure. It is scarcely necessary to say that this space is entirely inadequate for the proper presentation of this class of fossils.

It becomes important to consider this subject in view of the approach to completion of volume VII. Not only is it necessary to consider the question of the procuring of material for study and illustration, but the question as to whether a work begun in 1867 shall, after a lapse of twenty years, be continued and published upon the basis of the knowledge then possessed, or whether we will recognize the great progress made during that period and adapt our work to the existing state of our knowledge.

In conclusion, I beg leave to call your attention to the accompanying list of genera of Lamellibranchiata published and illustrated in volume V, part I, of the Palæontology of New York, together with a list of other Palæozoic genera which it has been proposed to illustrate in a bulletin of the State Museum of Natural History. Should the board remain of the same opinion as formerly it becomes very desirable to take some steps to procure specimens for illustration and to keep in view the plan of final publication.

I am very respectfully, your obedient servant.

JAMES HALL.

STATEMENT OF THE CONDITION OF THE WORK ON THE BRACHIOPODA.
PALEONTOLOGY OF NEW YORK, VOLUME VIII. COMMUNICATED
BY C. E. BEECHER.

December 3, 1887.

The condition of the volume on the Brachiopoda has remained unchanged since the date of the last report of the State Geologist.

Work was begun upon this volume, on the completion of the fourth volume of the Paleontology in 1867, and was continued with some lapses until 1878. About one-fourth of the labor may be considered as finished. Twenty-eight plates are lithographed and printed, illustrating three families and comprising twenty-one genera of Brachiopoda. The remaining twenty-nine plates yet to be done, should, embrace eleven families, comprising about eighty genera.

Besides the illustration of the general form and characters of the genera, some work has been undertaken towards a study and illustration of the microscopic structure of the shell in the numerous species of this class of organisms. About two hundred and fifty microscope slides have been prepared, comprising the shells of nearly eighty species and about sixty photographic negatives, illustrating shell structure, have been taken.

Very little additional material for the completion of this volume, exists in the collections belonging to the State, and considerable field-work must be undertaken before systematic work can be commenced. The very full illustration already given of the twenty-one genera now on the printed plates, will make a disproportionate presentation of the remaining eighty genera, if presented according to the restricted limits determined by the law and contracts of 1883. It should be borne in mind also that since the inception of this work, several important monographs have been issued in England, France, Belgium, Germany and Bohemia, and the original plan will require radical modification before any creditable work can be published.

BRACHIOPODA.

I.	XVIII. Productidæ.*
II.	XIX. Productidæ.*
III.	XXI. Spiriferidæ.*
IV.	XXII. Spiriferidæ.*
AV. Orthidæ. *	XXIII. Spiriferidæ.*
V. Orthidæ. *	XXIV. Spiriferidæ.*
VI. Orthidæ. *	XXV.
VII. Orthidæ. *	XXVI.
VIII. Strophomenidæ.*	XXVII.
IX. Strophomenidæ.*	XXVIII.
X. Strophomenidæ.*	XXIX.
XI. Strophomenidæ.*	XXX. Spiriferidæ.*
XIA. Strophomenidæ.*	XXXI. Spiriferidæ.*
XII. Strophomenidæ.*	XXXII. Spiriferidæ.*
XIII. Strophomenidæ.*	XXXIII. Spiriferidæ.*
XIV. Strophomenidæ.*	XXXIV. Spiriferidæ.*
XV. Strophomenidæ.*	XXXV. Spiriferidæ.*
XVI. Productidæ.*	XXXVI. Spiriferidæ.*
XVII. Productidæ.*	

CLASSIFICATION OF THE BRACHIOPODA [AFTER ZITTEL] (PALÆOZOIC).

A. Order Pleuropygia, Bronn.

Family.	Genera.
1st. Lingulidæ, King.....	4
2d. Obodidæ, King.....	10
3d. Discinidæ, Davidson.....	3
4th. Trimerellidæ, Davidson and King	4
5th. Craniadæ, D'Orbigny.....	3

B. Order Apygia.

1st. Productidæ, D'Orbigny.....	4
2d. Strophomenidæ, King.....	20
3d. Koninckinidæ, Davidson.....	1
4th. Spiriferidæ, D'Orbigny.....	23
5th. Atrypidæ, Dall	5
6th. Rhynchonellidæ, D'Orbigny	13
7th. Stringocephalidæ, Davidson	2
8th. Thecideidæ, King.....	1
9th. Terebratulidæ, King (emend. Davidson)....	6
14 families.	99

* Plates lithographed.

LAMELLIBRANCHIATA.

LIST OF GENERA ILLUSTRATED ON THE PLATES OF THE REPORT OF THE
STATE GEOLOGIST FOR 1882, PREPARED BY MR. C. E. BEECHER.

- | | |
|-------------------------------|--------------------|
| 1. Pernopecten. | 31. Macrodon. |
| 2. Crenipecten. | 32. Nyassa. |
| 3. Euchondria. | 33. Dystactella. |
| 4. Pterinopecten. | 34. Schizodus. |
| 5. Aviculopecten. | 35. Cytherodon. |
| 6. Lyriopecten. | 36. Conocardium. |
| 7. Pterinea. | 37. Paracyclas. |
| 8. Limoptera. | 38. Megambonia. |
| 9. Ectenodesma. | 39. Solemya. |
| 10. Actinopteria. | 40. Amnigenia. |
| 11. Ptychopteria. | 41. Megalomus. |
| 12. Glyptodesma. | 42. Lunulicardium. |
| 13. Leiopteria. | 43. Panenka. |
| 14. Leptodesma. | 44. Glyptocardia. |
| 15. Pteronites. | 45. Euthydesma. |
| 16. Gosselettia. | 46. Grammysia. |
| 17. Mytilarca. | 47. (Sphenomya.) |
| 18. s. g. Plethomytilus. | 48. (Leptodomus.) |
| 19. Modiola, s. g., Mytilops. | 49. Modiella. |
| 20. Palaeopinna. | 50. Palæanatina. |
| 21. Byssopteria. | 51. Prorhynchus. |
| 22. Microdon. | 52. Prothyris. |
| 23. Modiomorpha. | 53. Tellinopsis. |
| 24. Goniophora. | 54. Cypricardina. |
| 25. Sphenotus. | 55. Orthonota. |
| 26. Leda. | 56. Palæosolen. |
| 27. Nucula. | 57. Phthonia. |
| 28. Nuculites. | 58. Pholadella. |
| 29. Palæoneilo. | 59. Cimitaria. |
| 30. Ptychodesma. | |

LIST OF GENERA NOT ILLUSTRATED ON THE PLATES OF THE GEOLOGIST'S
REPORT OF 1882, TOGETHER WITH THE AUTHOR'S NAME AND REFERENCES
TO THE EARLIEST PUBLICATION OF THE SAME.

1. *Entolium*, Meek. Geol. of California, vol. 1, app. B, p. 478. Jurassic.
2. *Streblopteria*, McCoy. Am. Mag. Nat. Hist., 2d ser., vol. 7, for figure, see Syn. Carb. Foss., Ireland, pl. 12, fig. 5.
3. *Vertumnia*, s. g., Hall. Pal. N. Y., vol. v., pt. ii., pl. 24, fig. 12. *Vertumnia avis*.
4. *Aricula*, Klein, 1753. Ostreæ.
5. *Actinodesma*, Sandberger. Nassau, Pl. 29, figs. 17, 17a. *A. malleiforme*, Sand.
6. *Pteronitella*, Billings. Pal. Foss., vol. 2, 1874. Pl. 9, fig. 5.
7. *Pseudomonotis*, Beyrich, 1862. Deutsch Geol. Gesell., vol. 14.

8. *Ambonychia*, Hall, 1847. Pal. N. Y., vol. 1, p. 523. Pal. Ohio, vol. 2, pl. 2.
9. *Modiolopsis*, Hall, 1847. Pal. N. Y., vol. 1. Pal. Ohio, vol. 2, pl. 2, fig. 17.
10. *Pyrenomæus*, Hall, 1852. Pal. N. Y., vol. 2, pl. 27, fig. 12.
11. *Tellinomya*, Hall, 1847. Pal. N. Y., vol. 1. Pal. Ohio, vol. 2, pl. 2, fig. 24.
12. *Cardiopsis*, Meek and Worthen, 1861. Proc. Acad. Nat. Sci. Phila.
13. *Cleidophorus*, Hall, 1847. Pal. N. Y., vol. 1.
14. *Astartella*, Hall, 1858. Geol. Rept. Iowa. Pl. 29, fig. 1.
15. *Lyrodesma*, Conrad, 1841. An. Geol. Rept. N. Y. Pal. Ohio, vol. 2, pl. 1, fig. 25.
16. *Cuneomya*, Hall and Whitfield, 1875. Pal. Ohio, vol. 2, pl. 2, figs. 9, 10.
17. *Palæocardia*, Hall, 1867. 20th Rept. N. Y. State Cab., pl. 14, figs. 11, 12.
18. *Amphicælia*, Hall, 1867. 20th Rept. N. Y. State Cab., pl. 14, fig. 15.
19. *Orthodesma*, Hall and Whitfield, 1875. Pal. Ohio. vol. 2, pl. 2, fig. 7.
20. *Anomalodonta*, S. A. Miller, 1874. Cin. Jour. Nat. Hist. Soc., vol. 1, p. 17, fig. 8.
21. *Eopteria*, Billings, 1865. Pal. Foss., vol. 1, p. 306, fig. 298.
22. *Euchasma*, Billings, 1865. Pal. Foss., vol. 1, p. 361, fig. 348.
23. *Allorisma*, King, 1844. Am. Mag. Nat. Hist., vol. 14.
24. *Anatina*, Lamarek, 1809. Phil. Zool.
25. *Chænomya*, Meek., 1864. Pal. of Upper Missouri, p. 43, pl. 2, fig. 1.
26. *Chænocardia*, Meek and Worthen, 1869. Proc. Acad. Nat. Sci., Phila.
27. *Clinopistha*, Meek and Worthen, 1870. Proc. Acad. Nat. Sci., Phila.
28. *Dexiobia*, Winchell, 1863. Proc. Acad. Nat. Sci., Phila. (*Dualina* Barrande.)
29. *Ilionia*, Billings, 1875. Can. Nat. and Geol., p. 301, fig. 1.
30. *Promacrus*, Meek, 1871. Am. Jour. Conch., vol. 7.
31. *Sedgwickia*, McCoy, 1844. Synop. Carb. Foss., Ireland, pl. 11, fig. 39.
32. *Carbonarca*, Meek and Worthen, 1870. Proc. Acad. Nat. Sci., Phila.
33. *Solenomya*, Lam., 1818. Hist. Nat. Anim. sans Vert., vol. 5.
34. *Aviculopinna*, Meek., 1867. Am. Jour. Sci., vol. 44. Dyas. Geinitz, pl. 2, fig. 13.
35. *Bakevellia*, King, 1849. Permian Fossils, pl. 14, figs. 29, 30, 33.
36. *Monopteria*, M. & W., 1866. Proc. Chicago Acad. Nat. Sci.
37. *Monotis*, Bronn, 1824. System Urweltlicher Konchylien.
38. *Posidonia*, Bronn, 1824. System Urweltlicher Konchylien.
39. *Posidonomya*, Bronn, 1837. Leth. Geogn.
40. *Cardium*, Linn., 1758. Syst. Nat. 10th ed. (probably not found in palæozoic rocks).
41. *Astarte*, Sowerby, 1818. Min. Conch., vol. 2 (probably not found in palæozoic rocks).
42. *Cardinia*, Agassiz, 1838. In Societ. Basil.
43. *Cycloconcha*, S. A. Miller, 1874. Cin. Quar. Jour., vol. 1, p. 231, figs. 21, 22.
44. *Cypricardella*, Hall, 1858. Trans. Alb. Inst., vol. 4.
45. *Cypricardia*, Lamarek, 1801. Syst. An. sans Vert. (probably not found in palæozoic rocks).
46. *Cypricardites*, Conrad, 1841. An. Geol. Rept., N. Y.
47. *Isocardia*, Klein, 1753. Tent. Meth. Ostr.

48. *Matheria*, Billings, 1858. Can. Nat. and Geol. vol. 3, p. 440, fig. 18.
49. *Pleurophorus*, King, 1844. Ann. Mag. Nat. Hist. vol. 14.
50. *Lucina*, Bruguière, 1792. Ency. Meth.
51. *Anthracomya*, Salter, 1861. Mem. Geol. Survey of Gt. Britain.
52. *Anodontopsis*, McCoy, 1851. Ann. Mag. Nat. Hist. vol. 7, 2d series.
53. *Anthracopectera*, Salter, 1862. Mem. Geol. Survey of Gt. Britain.
54. *Lithophaga*, Lamarck, 1812. Hist. An. sans Vert.
55. *Myalina*, De Koninck, 1844. Desc. Anim. Foss. Carb. Belg.
56. *Mytilus*, Linn. (Unknown in palæozoic rocks.)
57. *Lima* Bruguière. (Unknown in palæozoic rocks.)
58. *Ostrea*, Linn. (Unknown in palæozoic rocks.)
59. *Pinna*, Linn. 1758. Syst. Nat.
60. *Pinnopsis*, Hall, 1843. Geol. Rep. 4th Dist. p. 243, fig. 106, 7. Syn. for *Limulicardium*, Pal. N. Y., vol. v., pt. 1, pl. 71.
61. *Solen*, Linn., 1858. Syst. Nat. (Probably not found in palæozoic rocks.)
62. *Solenopsis*, McCoy, 1844. Carb. Foss., Ireland, p. 47, pl. 8, fig. 2.
63. *Sanguinolaria*, Lamarck, 1801. Syst. An. sans Vert. (Probably not found in palæozoic rocks.)
64. *Dolabra*, McCoy. Syn. Carb. Foss., Ireland, p. 64, pl. 11, fig. 10.
65. *Egilops*, Hall, 1850. 3d Rept. State Cab., p. 171, pl. 4, fig. 1.
66. *Ischyrinia*, Billings, 1866. Catal. Sil. Foss. Anticosti.
67. *Anthracosia*, King, 1844. Ann. Mag. Nat. Hist.
68. *Angellum*, S. A. Miller, 1878. Jour. Cin. Soc., vol. 1.
69. *Orthonotella*, S. A. Miller, 1882. Jour. Cin. Soc.
70. *Priscoitara*, Conrad, 1867. Am. Jour. Conch., vol. 3.
71. *Pyanomys*, S. A. Miller, 1881. Jour. Cin. Soc., vol. 4, p. 318, pl. 8, fig. 4.
72. *Vanuxemia*, Billings, 1858. Can. Nat. and Geol., vol. 3, p. 439, fig. 17.
73. *Euthydesma*, Hall, 1885. Pal. N. Y., vol. v, pt. 1. Lam. II.
74. *Spathella*, Hall, 1885. Pal. N. Y., vol. v, pt. 1. Lam. II.
75. *Cardiola*, Broderip, 1834. Trans. Geol. Society.
76. *Ioldia*, Muller, 1842. Kroyer's Nat. Tid. (Probably not found in palæozoic rocks.)
77. *Præcardium*, Barrande, 1881. Syst. Sil de Bohême.
78. *Paracardium*, Barrande, 1881. Syst. Sil de Bohême.
79. *Pararca*, Hall, 1885. Pal. N. Y., vol. v., pt. 1. Lam. II.
80. *Glossites*, Hall, 1885. Pal. N. Y., vol. v., pt. 1. Lam. II.
81. *Elymella*, Hall, 1885. Pal. N. Y., vol. v., pt. 1. Lam. II.
82. *Protomya*, Hall, 1885. Pal. N. Y., vol. v., pt. 1. Lam. II.
83. *Allocardium*, Hall, 1884. Pal. N. Y., vol. v., pt. 1. Lam. I.
84. *Sanguinolites*, McCoy, 1844. Carb. Foss. of Ireland, p. 47.

59 Genera are illustrated on the plates of the Geologist Report.

84 Genera which are not there illustrated.

143 total number of genera of Lamellibranchiata which have been referred to American Palæozoic formations.

REPORT ON THE BONES OF MASTODON OR ELEPHAS FOUND ASSOCIATED WITH CHARCOAL AND POT- TERY AT ATTICA, WYOMING COUNTY, N. Y.

JAMES HALL, LL. D., *State Geologist*:

SIR.—Late in the autumn of 1886 my attention was called to the discovery of some mastodon bones in the village of Attica, Wyoming county, N. Y., and shortly thereafter, under your direction, I visited the place for the purpose of determining if the discovery merited the attention of the State Museum. The visit elicited the fact that some workmen, while engaged during the month of September or October of that year in digging a trench for a water-main alongside the road-bed of Genesee street in that village, partly uncovered a tusk, at a depth of about three feet from the surface. The tip of the tusk was left projecting for about six inches into the trench, and being regarded by the workmen as a hemlock root, no especial attention was paid to it until it was hacked in two with a pickax, in order to get the obstruction out of the way of the water-pipes. Its nature was thereupon recognized by some of the lookers-on. The tusk was removed, and the excavation widened over an area of about twenty-five square feet, in a search for other bones of the skeleton. This search resulted in finding two ribs and a portion of the zygomatic arch, which lay four or five feet away from the position of the tusk, and a foot or more further down. Finding nothing more, the hole was filled up, and the bones found came into the hands of Mr. W. F. Cogswell, of Attica. At the time of my first visit to the place the tusk was found to be in an unusually well preserved condition, considering the harsh treatment it had received at the hands of the workmen, and is of exceptional interest, as its small size indicates a quite young animal. As far as could be judged at that time, with the ground covered with snow, the spot where the bones lay appeared to be in a narrow sink-hole extending beneath the bed of the road-way and apparently connected with a somewhat larger sink-hole lying back of the first range of lots on the west side of the street.

In a brief report of these observations made to yourself soon after this visit (Sixth Rept. State Geologist, p. 34, 1887), it was suggested that, on account of the limited area of these sink-holes, the probability of finding the remainder of the skeleton was such as to justify a reasonable expenditure by the State Museum. An appropriation was accordingly made for this purpose, and, acting under your directions, I took charge of the excavations which were undertaken early in the month of August, 1887.

It was found that, as at first reported, there were two small bog-holes, the smaller lying mostly within the boundaries of Genesee street, and, as the excavation proved, very narrow. The work of excavation was begun at the point where the tusk had been found, and was carried in all directions until the muck or mucky clay petered out. This gave the hole a diameter of about thirty feet north and south, and somewhat more east and west, the vertical section through its deepest point being:

Made ground (road-bed, etc.).....	2 ft. 10 in.
Loam	0 5
Clayey muck.....	1 2
Clay (unlaminated).....	1 5
Clay (laminated) ..	0 0
	<hr/>
	5 ft. 10 in.
	<hr/>

A few bones only were found; these being fragments of ribs taken from the unlaminated clay at a depth of two feet six inches from the *natural surface* of the ground, a little west of the deepest point in the hole; several ribs, nearly entire, from the unlaminated clay, at a depth of three feet from the natural surface; and in the muck above these, one foot below the natural surface, the ankle bones of some large ruminant, probably the elk. Excavation was then begun in the large bog-hole lying in a pasture lot belonging to the Messrs. Smith and Cogswell, 297 feet west of the west line of Genesee street. A series of trenches were put down in various directions, which showed that this hole was circular, measuring seventy-five feet in diameter, and was filled by a very shallow accumulation of black muck and mucky clay. This material reached a thickness of from twelve to fifteen inches, except at a single point where over a surface twelve feet square it extended to a depth of four feet. All of this vegetable earth was underlain by compact laminated clay. At the bottom of the deep accumulation of muck, and four feet from the natural surface of the ground, was found a fragment of pottery, and from beneath and around it were taken about thirty fragments of thoroughly burned charcoal. These traces of ancient man were found fully twelve inches further down from the natural surface of the ground than the deepest of the bones taken from the other sink-hole.

The connection of the two sink-holes, and their former drainage from one to the other, was established by a series of excavations between them, which showed the vegetable mold to be continuous between the two, with a thickness of from three to six inches, though

rapidly thinning out to the north and south, giving the drainage way a width of only a few feet. No bones were found in the larger sink-hole, but four small fragments of charcoal were subsequently found in the clayey muck of the smaller hole, from which the ribs were taken. These, it would appear, had been washed out of the sink-hole above. Indeed, the finding of so few of the bones of the skeleton of this mastodon or elephant, and the ankle-joint bones of the undetermined ruminant, which were evidently deposited when held together by the ligamental tissue, and all these in so small a bog-hole, indicate that in all probability the hole had been flushed at times of high water, and the remnants of the skeletons carried away.

The fragment of pottery found is made of coarse, angular (crushed?) fragments of quartz and feldspar (orthoclase), mixed with clay. Its greatest thickness is five-eighths of an inch. A portion of the upper edge of the pot to which it belonged is retained. The curvature of the lower portion of the fragment, if carried out in a circle, indicates a vessel having a diameter of slightly more than eight inches, flaring a little toward the mouth. The outer surface is marked by low, somewhat irregular, transverse ridges, perhaps from wear being less conspicuous than those upon the inner surface, where, instead of being transverse, they are longitudinal. The fragments of charcoal vary in size from two inches in diameter down, and appear, with one exception, to have been thoroughly burned.

The peculiar occurrence of the pottery and charcoal at the bottom of this deep hole in the clay of the larger bog is difficult to explain. No evidence was apparent, in the course of the excavation, that this hole in the clay had been artificially dug out or filled. The area over which the relics were scattered was not more than four feet in diameter, through a depth of eight or ten inches. To assume that these relics had sunk to this depth when the black earth was in a semi-fluid condition, asks too much of chance, for though so ponderable a substance as a piece of pottery might work its way through the soft mud to a considerable depth, the numerous pieces of charcoal would hardly and in unison do this.

As to whether the bones (tusk, ribs and zygoma) found are those of the mastodon or elephant it is difficult to decide, none of them showing distinctive characters. The probabilities are, however, undoubtedly, that they are mastodonic.

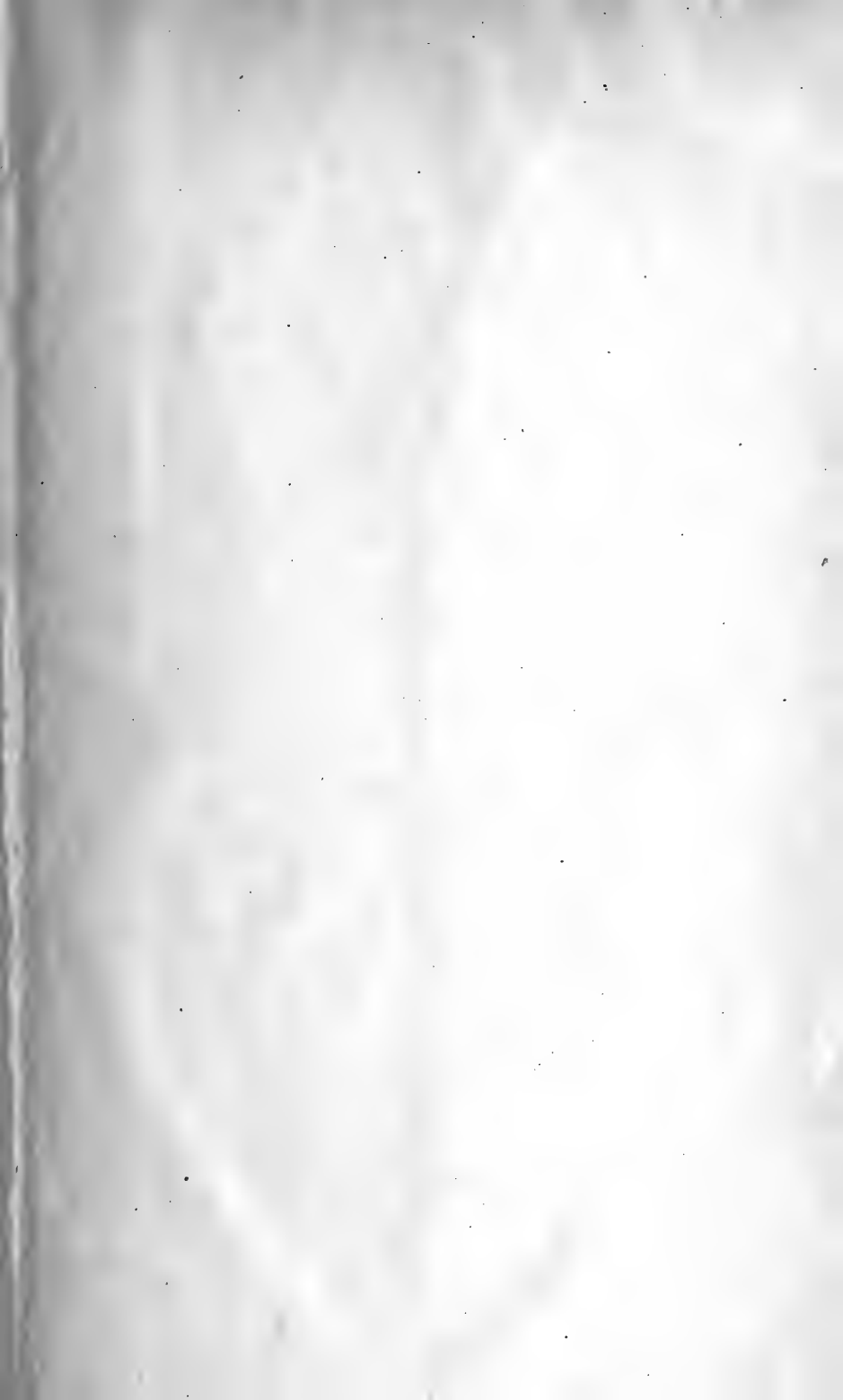
I am, sir, very respectfully yours,

J. M. CLARKE.

October 1, 1887.











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New York State Museum

Vol. 43.

1890.

Annual report.

(for the year 1889)

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